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ABSTRACT

REPORTED IS A PROGRAM FOR MODELS FOR IN-SERVICE SCIENCE TRAINING PROGRAMS WHICH SCHOOL SYSTEMS COULD USE AS THEY PLAN FOR THE IMPROVEMENT OF SCIENCE EDUCATION FOR CHILDREN. THE CONSUMERS OF THIS PROGRAM'S SERVICES INCLUDED CLASSROOM TEACHERS (K-8), SCIENCE SUPERVISORS, CURRICULUM DIRECTORS, AND BUILDING PRINCIPALS. PERSONNEL INVOLVED IN PROGRAM DEVELOPMENT AND IMPLEMENTATION INCLUDED A PROGRAM COORDINATOR, ADJUNCT STAFF FROM A LOCAL SCHOOL DISTRICT, UNIVERSITY PROFESSORS, AND AD HOC CONSULTANTS. BASED ON DATA ACCUMULATED FROM TRAINING FEEDBACK FORMS, IT WAS CONCLUDED THAT PARTICIPANTS REACTED MOST POSITIVELY TO: (1) GENERAL SESSION ACTIVITIES IN WHICH CONTENT WAS OF PRACTICAL VALUE, (2) GENERAL SESSIONS PRESENTED BY OUTSIDE CONSULTANTS USING MULTIMEDIA, (3) GROUP ACTIVITY SESSIONS IN WHICH THEIR INVOLVEMENT WAS MAXIMIZED AND THEY WERE ABLE TO MANIPULATE MATERIALS AND INTERACT ON WHAT THEY WERE DOING. DATA GATHERED BY A SEMANTIC DIFFERENTIAL INDICATE THAT PARTICIPANTS ATTITUDES SHIFTED SIGNIFICANTLY TOWARD A MORE POSITIVE ATTITUDE TOWARD THE INQUIRY APPROACH AND THE PRESENTATION OF SCIENCE TO CHILDREN. THIS WORK WAS PREPARED UNDER AN ESEA TITLE III CONTRACT. (BR)

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SUMMATIVE REPORT

THE INNOVATIVE SCIENCE TRAINING PROGRAM

1968-1969

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I. OVERVIEW

Innovative Science Training Programs

COMPONENTS OF THE MODEL PROGRAM

Activities

The Innovative Science Training Program assumed its own uniqueness in not focusing its attention on training activities. Rather, these activities represented the means to the end product and not the end product itself. The program's major focus was on the development of viable models for in-service science training programs which school systems could use as they plan for the improvement of science education for children. In some instances the training activities were designed to meet the individual needs of the particular school systems seeking the services of the program. Other training activities were initiated by the program coordinator who had special interests in attempting to develop certain types of models.

Released time was utilized for some of the activities of this program. This released time was not given exclusively to training activities. During the program there were instances when the time was provided for such activities as a series of curriculum group meetings and the development of a dissemination publication related to one of the program's projects.

Consultant services were made available dependent upon the needs of the consumer. The services offered included working with curriculum groups, recommending science programs (based on the consumer's available resources), and speaking engagements on various topics in science education and other related areas.

Personnel

The producers of the Innovative Science Training Program included a program coordinator (William F. Labahn) and his secretary (Mrs. Gertrude Treder). During various phases of this program additional personnel were involved in the program development and implementation. Three individuals who should be recognized as adjunct staff in this program were Frank Dzikonski, Arlington Heights School District 25; Dale Good, University of Illinois, Urbana, Illinois and Dr. Harold Collins of Northern Illinois University, DeKalb, Illinois. In addition, a number of ad hoc consultants were also instrumental in the development and implementation of the Innovative Science Training Programs. (See Appendix D).

The consumers of this program's services during its single year of operation included classroom teachers (K-8), science supervisors, curriculum directors, and building principals. These professionals came from school systems within the consortium served by the Center (8 Northwest suburban public school districts and parochial schools)* as well as from other areas throughout the State of Illinois.

Location

This program was based at the Elk Grove Training and Development Center, 1706 West Algonquin Road, Arlington Heights, Illinois.

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* Palatine Community Consolidated School District #15
Wheeling Community Consolidated School District #21
Prospect Heights School District #23
Arlington Heights School District #25
Schaumburg Community Consolidated School District #54
Mt. Prospect School District #57
Elk Grove Consolidated School District #59
Township High School District #214

Training activities were carried out at various schools located within the consortium. In addition, schools requesting service outside the consortium provided training facilities.

II. RATIONALE

In order to comprehend the rationale which serves as the basis for the Innovative Science Training Program, it seems necessary to turn back the clock and examine historically that which many science educators have referred to as the "science curriculum revolution".

It is not necessary to go back in time very far to find the rudiments of this revolution. In fact, we need go back only to the late 1950's. The "Science Curriculum Revolution" was spawned shortly after World War II. Advances in science and technology played a significant role in creating the desire to examine science programs for children within our educational systems. Large sums of money and talent were channeled into programs designed to upgrade the efforts of the scientific enterprise. In 1957, Sputnik I, launched by the Russians, added impetus to our efforts. The need to train a great number of scientists and technicians surfaced and became the object of much attention.

Rethinking Science Education was the title of the 59th yearbook of the National Society for the Study of Education [1]. This title reveals the status of science teaching today. The revolution in science education has been a genuine revolution rather than a mere rehashing of old ideas. The methodological procedures and subject matter content have undergone close scrutiny. Three highly significant factors which have greatly influenced this revolution are:

1. the change in philosophy of science education
2. the new willingness of scientists and educators to pool their talents
3. new sources of money [2].

The basic philosophy of scientists and educators who formed curriculum groups to develop new courses of study was presented by Paul DeHart Hurd in a paper entitled, "The New Curriculum Movement in Secondary School Science Teaching". This paper was presented before the Association for Supervision and Curriculum Development in 1962.

> What then should be the educational conditions under which new courses are developed? The thrust in education that will enable young people to live intellectually in a world in which they are going to live. What is taught must have value beyond the context in which it is learned. Learning in every course must be durable, counting for the rest of the student's life... Young people must be qualified to deal with ideas not yet born and discoveries not yet made...There is too much to know and too much demanded of one today to be able to afford learning that frequently withers into obsolescence before the course is over [3].

The talent pool concept which characterized the program development process of the curriculum groups emerged over a long period of time. For example, nearly all high school science books were written by college scientists from the late 1800's to the early 1900's. These texts paid little attention to the teaching methods utilized by professional educators and psychologists. This pattern gradually changed and by the 1930's and 1940's the process had reversed. During this period, nearly all high school science books were written by educators. During the 1950's, a new pattern of developing science instructional materials emerged. It was during this period that scientists and educators began collaborating and pooling their talents. The scientist stepped from his laboratory and the teacher stepped from his classroom and worked together. They took a long, hard look at science teaching [2]. These groups along with professional educators and psychologists from colleges and universities set about the task of restructuring the science programs utilized within our educational systems.

The "science curriculum revolution" would not have been possible without a source of funds that could support massive large scale curriculum projects. The major sources of funds were governmental agencies, particularly the National Science Foundation (NSF) and the U.S. Office of Education. In addition to these sources of funds, private foundations channeled monies into science curriculum improvement projects. The major programs which emerged during the curriculum revolution could not have been developed, nor could they have had any measurable impact without these sources of funds.

In addition to the discussion of the factors which influenced the "curriculum revolution", it seems worthwhile to note relevant events of the progression of the revolution. In 1957 the movement began at the secondary level. New courses reflecting a modern point of view were being developed in biology, physics, chemistry, and earth science. By 1960 there was a concomitant demand for the improvement in the teaching of science at the elementary level.

The American Association for the Advancement of Science (AAAS) held a series of three conferences (St. Louis; Berkeley, California; and Washington, D.C.) to explore the issues in dealing with the problem of improving elementary science education. The issues centered around four basic questions:

1. What underlying philosophy and what aspects of science should be basic to elementary school science instruction?

2. What problems exist regarding instructional materials; such as textbooks, resource units films', facilities, and equipment?

3. What improvements are desirable and practical in teacher preparation and programs in elementary school science teachers [4]?

This series of conferences brought together a diverse group of individuals to examine the major issues in elementary science education. The conference participants included scientists (representing the major fields of science), elementary school principals, school teachers, and specialists in science education. It was the general consensus that a large-scale, coordinated, and cooperative attack upon the problems of elementary science teaching should be undertaken.

Talent pools of scientists, teachers, educators, and psychologists have since been working to build new science programs which seek to improve science education for children in our elementary schools. In total, nine projects (each having its own goals) were and are being supported by funds from the National Science Foundation, U.S. Office of Education, and several private foundations. Three of these projects have been significantly influential in the improvement of science at the elementary level. Those adjudged to be of major significance are the AAAS Program, Science: A Process Approach; Elementary Science Study (ESS); and Science Curriculum Improvement Study (SCIS). In addition to the aforementioned projects, three additional programs have focused their attention on the improvement of science instruction at the junior high school level. These projects are the Earth Science Curriculum Project, Secondary School Science Project, and the Intermediate Science Curriculum Study.

The availability of an increasing number of innovative programs such as these has resulted in the development of a gap between the producers of the innovative programs and the consumers. The existing gap lies in the area of in-service training for teachers who use these programs with children. Jacqueline Grennan, President of Webster College in Missouri, expressed a cautionary note concerning the need to train teachers in the use of innovative programs prior to implementation into a classroom setting with children. Speaking before the National Conference on Higher Education held in Chicago in April, 1964, she said:

> Experimentation and innovation have been at the heart of the major curriculum developments for elementary and secondary education during the past decade. Indeed, it is the spirit of innovation and experimentation----often referred to as open inquiry, the inductive method, or the discovery method----which has characterized the very learning theory which is the critical factor in the successful use of the materials in the classroom. Nothing is more discouraging than to walk into a third-grade classroom to witness a lesson in mathematics developed by David Page or Robert Davis, or a lesson in science developed by Robert Karplus or Phillip Morrison being taught by a well meaning but incompetent teacher in a spirit completely antithetic to the open-ended nature of the materials themselves [2].

It is important to understand that science educators who have been actively concerned with innovative programs do not take a position which "damns and condemns" the pedagogy utilized by the classroom teachers of science. As a matter of fact, some teachers have been utilizing the methodology advocated in these new programs for a long time. They have done so prior to the attachment of new labels for the innovative programs' activities. However, such teachers are the exception rather than the rule. The school, or school system, which attempts to implement an innovative program by simply providing the teachers with a different set of materials makes a serious mistake. The new programs have not been made "teacher proof". They have not been designed to create an automatic change in teacher behavior which will maximize their effectiveness with children. The science revolution and the programs which have emerged from this revolution represent a significant departure from previously designed programs. The content is unique, organization patterns are different, and the desired style of presentation to children is divergent from that generally practiced in the schools.

The question which must next be dealt with regarding the science revolution and the direction of new programs is related to responsibility. An examination of the responsibility for in-service training programs will help the reader to better understand the position taken in this particular model program.

It is not the intent of this discussion to negate the importance of pre-service education. Admittedly, the hope for the future lies in the development of adequate pre-service teacher education. However, what of the thousands of teachers already in classrooms day in and day out? Where do they turn for assistance in their professional growth and development? Where does the burden of responsibility rest for the practicing teacher to gain new knowledge of the content and pedagogy of innovative science programs?

The National Science Foundation has been sponsoring summer institutes which are conducted by colleges and universities. These institutes have dealt with the content and methodology of the new science programs. The institutes vary in length from four to ten weeks. In addition to the summer institute programs, a few cooperative training programs have been developed in which school districts and nearby colleges have shared personnel and resources [5]. Teacher training institutions (e.g., National College of Education, Evanston, Illinois) have made available to teachers the opportunity to participate in training programs in how to teach a specific new program. However, the majority of this type of institution has held to the position that teachers should have a broad background and be able to use a variety of approaches. Various divisions of state departments of education have offered training programs for teachers. If we use Illinois as a measuring stick, these programs often deal in the generalities of providing the teacher with a broad background (usually emphasizing the subject matter of the sciences). Teachers have two other sources of assistance to aid them in their professional growth. Unfortunately both sources are in short supply. One source of aid is the utilization of outside consultants. However, the cost expense of bringing in outside consultants is prohibited for many systems. Secondly, curriculum specialists can provide significant experiences for teachers in the use of the new science programs. Here again we speak of a group of individuals that are in short supply. As a result of these shortages, schools must examine other means of providing in-service training for their teachers.

In the final analysis the local school systems must assume the major responsibility for in-service training of teachers. Institutions such as the National Science Foundation, other governmental agencies, state departments of education, colleges and universities can provide limited support systems. At best, these can only be regarded as temporary systems in that they conduct minimal kinds of training activities and them remove themselves from the local setting. More permanent support systems are needed if change is to be effective and if the innovation is to provide any degree of lasting impact in the presentation of science programs to children.

The dilemma which local educators must deal with when seeking answers to questions regarding in-service training is best characterized by the statements made by Bentley Glass upon his return to the United States after visiting the Japanese Science Education Centers. Glass said that the science teacher in the elementary or secondary school is at the mercy of this rapid advance of scientific knowledge. And that changing points of view falter and break under the pressures of heavy teaching loads, extracurricular duties, inadequate time to prepare for laboratory sessions, and salaries so low that summer jobs are necessary [5]. He also suggests that the declining level of science teaching in the schools has been partially met by the summer and in-service institutes funded by the National Science Foundation [5].

The rationale which underlies the Innovative Science Training Program model makes a number of assumptions with regard to what is being done and what should be done in the preparation of teachers to use new science programs with children. These assumptions are as follows:

1. A singular training activity or series of activities is insufficient to prepare teachers to deal with the new subject matter emphasis and pedagogy of the innovative science programs available for use with children.

2. Additional dimensions to innovation besides the sets of new materials must be considered to affect lasting change.

3. Because of the divergent nature of local school systems, it is essential to build in-service programs on local needs.

4. There are certain components in any in-service training program which should be utilized and these components are not mutually exclusive to any one program.

With these assumptions in mind, this model program has sought to develop, utilizing "experience-based approach" sets of viable strategies for in-service training programs. The in-service training program designs developed in this program provide school systems with alternative models as they prepare to consider in-service training for their teachers. These models are also designed to meet the criterion of flexibility. That is to say that they are guides for local in-service program planning, and the local system may choose to accept or reject any or all parts of the models developed. The one thing that systems are encouraged to consider is the fact that these models have been field tested and have proven to be operationally effective with teachers.

It is appropriate to conclude this statement of rationale with a passage from Desmond Morris's book The Naked Ape. In this particular passage he speaks of a new species of squirrel which has been discovered. It has no name.

> All we can be certain about is that the markings of its fur-its black feet-indicate that this is a new form. But these are only symptons. The rash that gives the doctor a clue about his patients disease. To really understand the new species we must really use these clues only as a starting point which tells us there is something worth pursuing [6].

This statement reflects the current status of our research and development activities with respect to programs developed during the curriculum revolution. It is too early to reach definite conclusions regarding the effectiveness of these programs with children. Formative stages of work are being done on the improvement of in-service programs for teachers of innovative science programs. If we can continue to improve the teachers' effectiveness in presenting science to children, we can improve the products of the educational enterprise. Thus we can improve our scientific-technological society.

III. PURPOSE

In education, we have readily recognized that individual differences exist among children. This recognition has led to the confrontation of how to deal with these individual differences. The degree of success in dealing with this problem is not a question here. However, what is in question is the fact that within our institutions that purport to be preparing teachers, a "prescriptive method" is utilized in which all individuals are treated the same. This is also true in the planning of in-service programs whether they are locally produced, or produced by outside agencies (i.e., colleges, universities, state departments of education, etc.). We have tended to treat school systems, schools and teachers within these systems the same. It is time to consider abandonment of this "universal prescriptive method" and consider the individual differences of the adult learners (teachers) within our school systems as we seek to upgrade our educational programs and the professionals who teach or administer these programs for our children. This point of view has been inherent within the operation of the innovative science training program developed at the Center.

The implication of this program's efforts are of prime importance for those considering the production of in-service training programs for teachers. However, it is suggested and assumed that this program's efforts are also relevant (in terms of operational modes) for institutions which are seeking to modify their pre-service preparation of individuals who are in training to enter the education profession.

Program Objectives

The science program of the T & D Center was instituted in January, 1968. The coordinator of this program undertook his assignment at a time when the Center had made commitments for the conducting of a training program on "process science".* The original objectives of the Science Program were established by the Director of the entire Center. The scope of the program was to include: (1) the establishment of demonstration classes illustrating the process approach in elementary science, (2) the conducting of seminars on the process approach, and (3) the conducting of training programs which would provide teachers and administrators with opportunities to learn and practice the process approach.

As the program developed initially under the leadership of the science coordinator, the original objectives were retained until July, 1968. At this time the coordinator evaluated the efforts of the program. Based upon this retrospective look at the program the objectives were modified. The greatest influencing factors in this program modification were: (1) a review of the literature which dealt with teacher education, (2) discussions with teachers regarding their needs with respect to preparation for dealing with innovation and change, and (3) additional input to the coordinator based on his experience in teacher training, and (4) intuitive feelings about meaningful training experiences.

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*Process Science places emphasis on the student in an active role of investigating Science--using the processes of scientists. These processes are identified by these terms: Observing, Describing, Classifying, using Space/Time relationships, using Numbers, Measuring, Communicating, Predicting, and Inferring. In addition, also included are such integrated skills as Formulating, Hypotheses, Controlling Variables, Interpreting Dates, Defining Operationally and Experimenting.

The result of this reassessment was the development of a new perspective regarding where attention should be focused in this program. Out of this perspective emerged a new set of objectives for the program as it was to be carried out during the 1968-1969 academic year.

The objectives of this program must be categorized into two distinct sets. One set encompassed the broad objective of the program. (See below). The second or sub-set objectives encompassed the potential effect on the consumers of this program's training offerings.

Within a broad context the major objective of this program was to:

> develop a series of alternative models for in-service science training programs for teachers.

The sub-set objectives for the consumers (teachers, curriculum directors, principals, consultants, etc.) involved in the trial of the various types of training models as they were developed were as follows: The consumer of a science training program will -

(1) develop a more positive attitude toward science.

(2) develop a more positive attitude toward new approaches to science teaching.

(3) perform the basic skills necessary in the manipulation of materials and equipment in new science programs.

(4) have knowledge of the various instruments employed in behavioral assessment.

(5) be able to exhibit proficiency in the use of behavioral assessment instruments in the analysis of their educational activities.

(6) have knowledge of the basic philosophy and learning theories embodied in the new science programs available for use with children.

It should be noted that in addition to the aforementioned sub-set objectives for the consumers of training programs additional sets of objectives were formulated for specialized training programs. For example, a training program on the utilization of the CIPP Evaluation Model developed at the Ohio State University Evaluation Center located at Columbus, Ohio was conducted in March, 1969. This program had its own unique set of objectives which were to:

1. Present the participants with global concepts of evaluation and its operation in a program setting, to create an awareness of the nature and importance of evaluation in education.
2. Create in the participants a positive attitude toward evaluation.
3. Provide the participants with a conceptual model of evaluation which can be used for the assessment of their classroom and/or system-wide programs.
4. Provide the participants with knowledge of various methods and techniques of data collection, to enable them to systematically assess classroom and system-wide variables.
5. Provide the participants with experience in selecting a method of evaluation and instruments appropriate for use in specific situations.

Other specialized training programs were conducted which also had their own unique sets of objectives for the consumers. The activities of these specialized training programs will be elaborated on in Section IV of this document.

Relation of the Innovative Science Training Program to the Basic Questions of the T & D Center

Prior to a consideration of how the science offerings of the Center have related to the basic questions of the T & D Center, it is useful for the reader to understand the objectives of the total Center.

These objectives were gleaned from the original Operational Grant (P. L. 89-10, Title III), United States Office of Education [10].

They were also stated in the Directory of Personnel and Services, 1968-69. The objectives were to:

1. build more effective working relationships among the several school districts and various outside agencies, including the Office of the Superintendent of Public Instruction, universities, other federally supported programs, industry, and private schools.
2. nurture innovative projects within cooperating schools that reflect:
   a. educational needs of the area
   b. available research findings
   c. demands of the nation as expressed through Congress and other legitimate groups.
3. support active dissemination of innovations (that meet the criteria listed in "2" above) through activities that include demonstrations, continuing education for professionals, and other approaches.
4. provide various services that meet these criteria and which:
   a. are more economically provided through the Center
   b. do not constrain local district programs.
5. support continuous evaluation of all projects and innovations with which the Center is associated [11].

The Participants and the Examination of Their Own Behavior

The coordinator has throughout the operation of this program taken the position that simply providing the participants with opportunities to examine and manipulate the components of innovative science programs is not sufficient to bring about change, and further, that this kind of experience is not sufficient to result in the successful implementation of a new program. The mere presence of a new program in the classroom does not and can not automatically insure success. Teachers must examine their behavior and the behavior of their students. They must do this on a periodic basis and in a systematic fashion. In doing so, they are able to gather data which can be used to assess that which actually is occurring in the classroom as compared with that which they have established as an ideal classroom behavior pattern (for both teacher and student).

The long term training programs which were established as a part of this program had built into their transactions blocks of time in which the participants were able to consider the rationale, instrumentation, methodology, interpretation and implications of various types of behavioral assessment instruments useful for change and the improvement of teaching. Included among the instruments and techniques considered were the following: Flanders System of Interaction Analysis, Verbal Interaction Category System, and Techniques of Clinical Supervision. A more detailed consideration of the behavioral assessment activities is presented in Section IV.

The Participant and Role Perceptions

The nature of various innovative science programs virtually forces participants in training, who are potential consumers of these programs, to carefully examine their roles in the utilization of these materials with students. In addition, they must also consider the role of the student in these programs. Both roles are considerably different from that which can be found within the "traditional" framework of our educational system.

The teacher is vital to the success of any innovative program. The program revolves around the teacher. The major difference in the role of the teacher in these programs as compared to their previously perceived role is that he is no longer the teller of facts - the answerman for all questions, the demonstrator of scientific phenomena.

Rather, the teacher is a guide, a stimulator, a listener, a questioner, and an inspirer. He is a source of encouragement for students as they explore man's environment through programs which maximize their involvement with objects found in the natural environment.

Strong emphasis was placed on the new roles of teachers and students as the training activities of this program were carried out. The participants were able to consider role changes through the utilization of a number of different processes. Initially, they were asked to think about changing roles via the traditional lecture method. That is to say, they were simply told that their role and the role of their students should be and would be different in new programs. Next, they were shown how the roles were different via a demonstration method. The trainers conducted lessons in which they employed methods which were exemplary role change. Finally, participants were able to teach lessons and gain added insights of the role change through their own direct involvement with children.

Skill Development Through Involvement in Training Programs

It would be difficult to delineate a specific set of skills which participants involved in the training activities of this program took with them upon their return to local school settings. The teaching of innovative science programs demands that teachers examine their styles and behaviors and modify them to convey the spirit of the science programs to their students. Out of the spirit of new science programs emerges learning.

Underlying any efforts to develop skills which the participants could utilize was the necessity to instill within them a receptivity to the innovations which are being suggested for implementation. The two threads which run through any training effort cannot be isolated and developed among participants one after another. Rather, these threads must be nurtured throughout the training experiences. These threads which must run through any training program are related to the development of positive attitudes toward the approaches being urged within the innovative science programs of today.

If successful in achieving significant attitude shifts in participants as a result of training activities, then the following should have accrued to the participants and affect their behavior back in their local school settings.

1. They should be more willing to exhibit a greater openness with respect to children's responses in discussion situations.
2. They should be more willing to allow students freedom of movement within the classroom.
3. They should be more willing to accept the healthy "chaos" created by maximizing student involvement in the learning situation.
4. They should be more willing to allow students to pursue their own avenues of special interest.
5. They should be more willing to accept student to student interaction within the classroom.
6. They should be more willing to assume a role of facilitator which leads to greater student involvement in the learning situation.
7. They should show less concern with finishing the year's science program as prescribed by the materials being used.
8. They should be more concerned about process-skill development.
9. They should be more concerned with the students' acquisition of concepts as opposed to the students' accumulation of factual information.
10. They should be willing to assume the role of advocates for change and innovation within their local school settings.

Participant Training Outcomes and Their Relationships to Students

At this point in time, it is difficult to assess empirically how the aforementioned changes in teacher behavior effect students in the classroom. There is no real experimental data available which shows that students in this type of a learning environment with the types of learning materials being urged today achieve at a significantly higher rate than those involved in traditional programs. Research is currently being conducted. Most of the data regarding the success and effects of these programs with students is primarily subjective and does not have the support of available research.

IV. ACTIVITIES

Introduction

The activities of this program fit into four categories. In this section of the report each category of activity is described. Each description is followed by an analysis of the activity. The categories to be discussed are as follows: (1) program development, (2) training, (3) dissemination, and (4) consulting.

Program Development

It will be recalled that within a broad context the major objective of the science program was to develop a series of alternative models for in-service science training programs for teachers. In carrying out this objective, the program coordinator in most instances took the position that programs should be developed based on the needs of the consumers. Further, that if such programs were developed based on consumer needs that even though the programs became very specific (for a specific school system) the basic strategies and techniques were the common threads which any school system could adapt to meet its needs.

During 1968-69, five programs were developed. They varied in length from one to six weeks. Program content outlines and syllabi are contained in Appendix B. The detailed transactions of these programs have been previously reported. Four of the five programs were designed to prepare teachers for leadership roles in planning and conducting in-service training programs for teachers. Two of the five training programs were designed to be carried out during the summer. One of the programs extended over a four week period of time, another over a six week period. A minimal standard for school systems adopting a new science program was a training program from one to five weeks in length. Another program provided the consumers with knowledge of various behavioral assessment techniques and evaluation procedures which would enable them to become more effective in dealing with children and adults and assist in their science decision making. Teachers in District #25, Arlington Heights, Illinois, one of the consortium school districts, requested that a program be designed to help them create internal changes in their science program.

Three of these training programs were developed with funds made available through the Department of Program Development for Gifted Children (Office of Superintendent of Public Instruction), Springfield, Illinois.

Analysis of Program Development Techniques

In analyzing the development techniques used in this model program, the procedures utilized seemed logical and educationally sound. The programs were developed through the cooperative efforts of the Center's Science Coordinator, school system personnel, and in some instances training consultants that were hired to conduct particular phases of various programs. Program activities were assessed, evaluation data analyzed, and the transactions were developed in report form for each program. These reports served two functions; first as a summative evaluation of the specific training effort and secondly, as a model for other school systems planning to establish in-service science training programs.

The science programs developed were experience-based. Evaluation data gathered on program effectiveness seemed to indicate that the *programs represented viable strategies which can be used in planning in-service programs for teachers. Thus, it is concluded that the methodology used in developing these programs is sound.*

Training

As mentioned previously, program development was experience-based. All training programs were designed to maximize participant involvement. This was particularly important in the initial sessions of each program. Examination of the individual reports on training programs reveals this fact [7, 8, 9, 10, 11]. In addition, interaction was also maximized. The VENN Diagram (Figure 1) illustrates the interaction patterns which prevailed in the training activities.

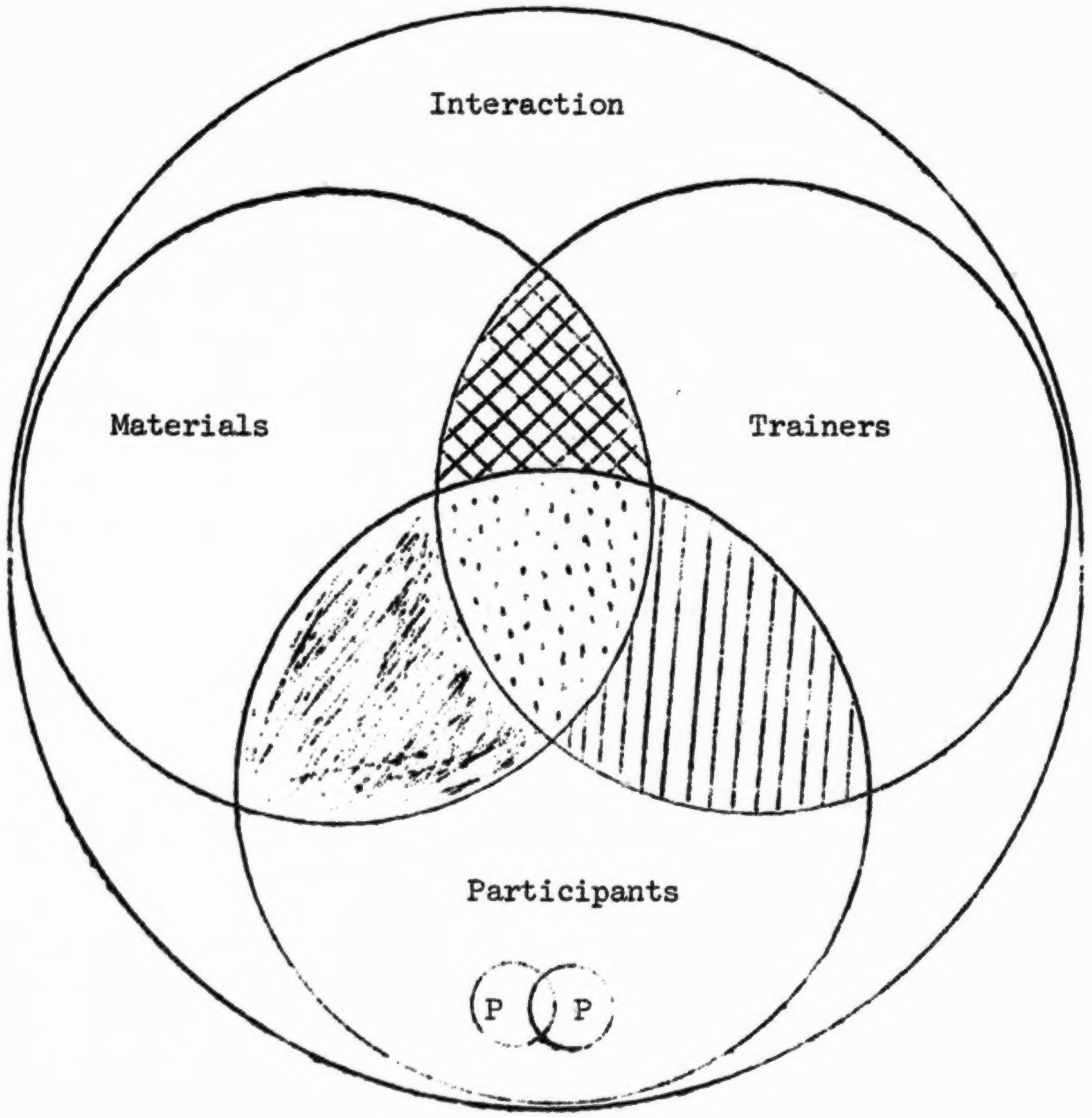

Interaction
Materials
Trainers
Participants
P
P

Figure 1

▦ Trainer - Materials

▓ Participant - Materials

(P)(P) Participant - Participant

▥ Trainer - Participant

⁘ Activity

The activities in each training program conducted had certain common characteristics. However, the amount of time in which participants engaged in the various activities was to a certain extent dependent upon the duration of the program. Also, the nature of certain types of training programs allowed for the introduction of certain types of divergent activities.

Figure 2 shows the approximate percentage of time spent on various types of activities. For illustrative purposes, the five training programs have been identified by a letter rather than their specific titles. Since the programs varied in length, this variation is also indicated. Each program's length is specified in sessions rather than weeks. Thus, A represents four sessions which met on four consecutive days. B represents five sessions which were conducted on a once-per-week basis. C represents eight sessions, four of which were conducted over a two week period, and four which were conducted on consecutive days. D represents sixteen sessions conducted over a four week period. These sessions were held on a four day-per-week basis. E is the same as D, except the sessions were conducted over a six week period of time.

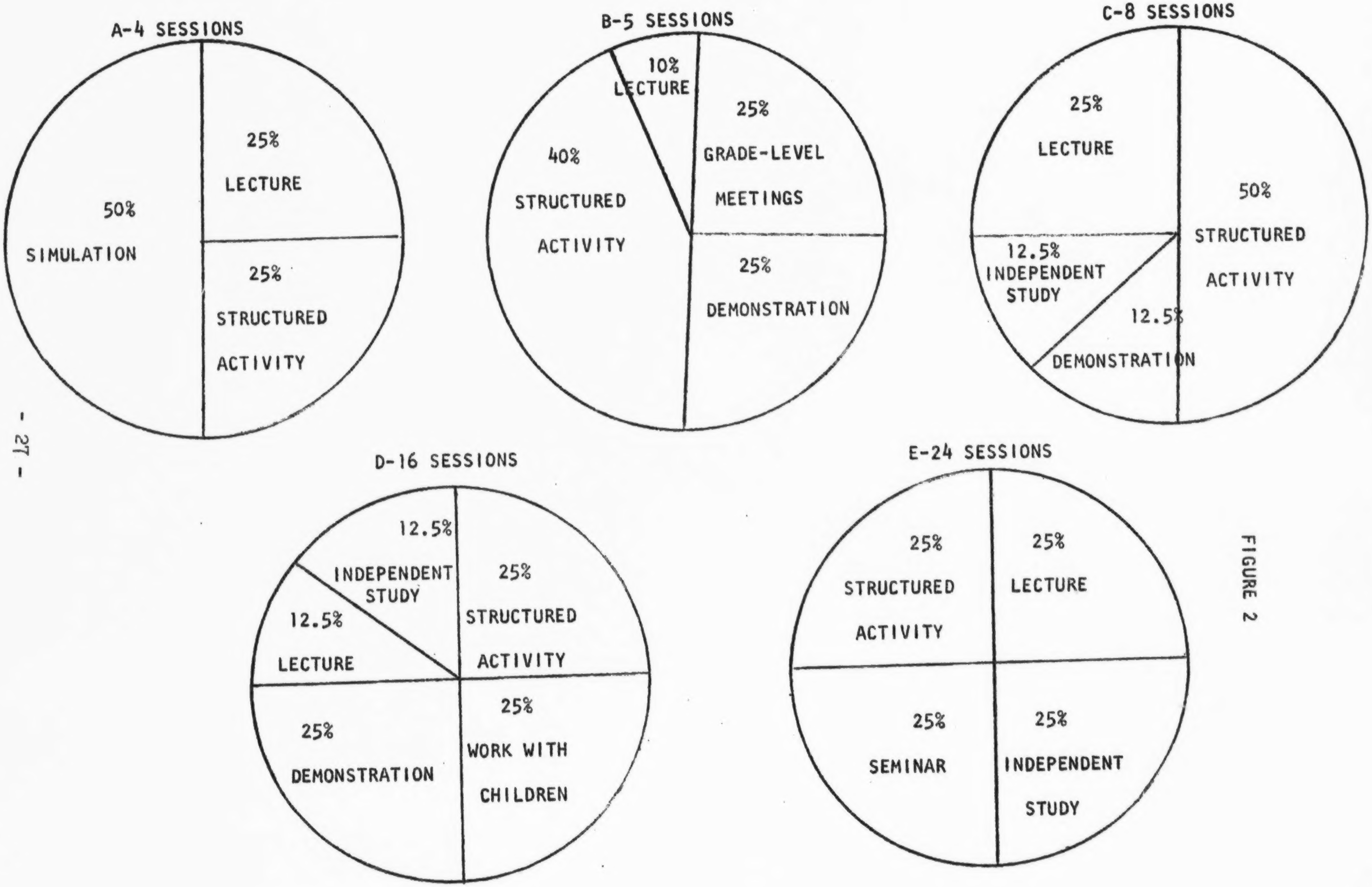

A-4 SESSIONS
50%
SIMULATION
25%
LECTURE
25%
STRUCTURED
ACTIVITY
B-5 SESSIONS
10%
LECTURE
40%
STRUCTURED
ACTIVITY
25%
GRADE-LEVEL
MEETINGS
25%
DEMONSTRATION
C-8 SESSIONS
25%
LECTURE
50%
STRUCTURED
ACTIVITY
12.5%
INDEPENDENT
STUDY
12.5%
DEMONSTRATION
D-16 SESSIONS
12.5%
INDEPENDENT
STUDY
12.5%
LECTURE
25%
STRUCTURED
ACTIVITY
25%
DEMONSTRATION
25%
WORK WITH
CHILDREN
E-24 SESSIONS
25%
STRUCTURED
ACTIVITY
25%
LECTURE
25%
SEMINAR
25%
INDEPENDENT
STUDY

FIGURE 2

Analysis of Training Techniques

The desire for an active role of the participants was stressed in most training activities. The program developer and program trainers attempted to provide variety in the types of participant involvement. The rationale for this was related to the belief that in dealing with any group of learners an "all or nothing" approach is not particularly effective. That is to say all lecture versus all structured activity is not necessarily good, nor is all demonstration, or all simulation, or all independent study. Rather there should be a blending of components in the planning of training programs. Techniques employed should be varied depending upon a number of factors including (1) composition of the training group, (2) objectives of the program, (3) time available to carry out the program, and (4) availability of resources (both human and material).

Available data from participant evaluations indicates that the variation in techniques worked effectively with the learners. In view of this, it is suggested that these techniques continue to be used in present form. However, the techniques certainly should be modified to meet specific needs. It should also be emphasized that the aforementioned factors (e.g., composition of training group, objectives, time and resources) will alter the techniques employed in particular training programs.

Dissemination

The dissemination activities of the science program fit into six categories. These categories included (a) sponsorship of a conference on modern science, (b) articles in the Training and Development Center

Newsletter, (c) distribution of printed materials at educational meetings and conventions, (d) distribution of the Training Program Designs series, (e) presentation of papers at national, regional and local educational conventions, conferences, and institute days, and (f) discussion sessions with interested individuals and groups.

Let us briefly consider how each of these activities was used as a dissemination device for the science program.

Sponsorship of Science Conference

During the early months of operation, the coordinator planned a Conference on the Implementation of Modern Science Programs. While the conference had its own particular set of objectives from the participants' point of view, the coordinator's primary objective was to make people aware of the science program which was in its formative stage of development at the Center.

A total of 1400 invitations was sent to members of the educational community throughout the United States. One hundred fifty-three individuals attended the conference. The group included teachers, principals, superintendents, curriculum directors, college and university professors, science supervisors, and representatives from various publishing companies. The program for this conference is reprinted in Appendix B.

Articles in T & D Center Newsletters

The T & D Center periodically sent out a newsletter reporting on and announcing the activities of the various model programs. This newsletter was sent to 3000 individuals connected with educational institutions throughout the country.

The science coordinator utilized this newsletter as a vehicle to announce training opportunities and report on activities which had taken place.

Distribution of Materials at Educational Conferences, etc.

During the last year of operation, the T & D Center displayed materials at the IASCD (Illinois Association for Supervision and Curriculum Development) state meetings, the National Convention of ASCD, and Northern Illinois University, DeKalb, Illinois. The Science Program Description (see Appendix B) and other science materials were distributed at these meetings. In addition, similar materials were distributed at Regional National Science Teachers' Association meetings held in Chicago, Illinois, and Denver, Colorado.

Distribution of "Designs" Series

During its operation, five training programs were developed. Copies of detailed descriptions of these programs were printed and distributed to members of the educational community at all levels.

Figure 3 shows the titles and number of copies distributed -

Titles*	Number Distributed
Summer Science 1968	975
Minimal Program	95
Evaluation Training	95
Arlington Project 68-69	100
Resource Consultant Training Program**	

Figure 3

* Designs for In-Service Science Training Series
** Available Summer 1969

Presentation of Papers

The coordinator of this program during the last year presented papers at a number of national and regional conventions and local institute days. The specific topics of the papers and locations of the presentations are found in Appendix A. With each presentation additional individuals became acquainted with the activities of the science program. Thus while the topics of the presentation were specific and not generally related to the activities of the program, dissemination was nonetheless accomplished because the coordinator was ultimately asked questions about the science program and the Center in general by those not acquainted with it.

Discussion Sessions with Interested Individuals

From time to time individuals or groups would contact the Center wishing to find out more about the program. In a numer of instances, requests were made to visit the Center and meet with the coordinator.

These individuals and groups were accommodated and returned to their educational institutions. It can be assumed that they disseminated their findings about the science program to others. An example of a group which fits this description were nine science consultants for the Chicago Public School System who spent a half day with the coordinator learning about the science program and exchanging ideas.

Analysis of Dissemination Activities

The relatively short fully operational duration of the science program (one year) does not enable the coordinator to fully assess the effectiveness of the dissemination activities. However, one bit of speculation which might indicate the effects of dissemination is that *during the last six months of operation many requests for training and speaking engagements were received. A number of these requests could not be honored due to the phasing out of the total Center. Also it is difficult to know what the priorities of school systems will be next year. One could speculate that as a result of dissemination activities, many requests for service may come to the Center. However, there will be no Center capable of providing service to the educational community.*

With respect to dissemination activities, all proved to be satisfactory. These techniques could, of course, be improved and experimentation with new techniques could be implemented.

Consulting Services

Consulting services in this program were made available upon the request of the consumer. Requests for service were a direct spin-off from two other activities of the science program, namely training and dissemination. Some examples of services provided included work with local curriculum study groups, individual consultations with area science consultants, and work with other model program coordinators.

Summary of Activities

The four components of the innovative science training program were strongly linked together. Often one activity resulted in the development of another. The activities were very independent. Figure 4 attempts to show the types of linkages which occurred in the science program.

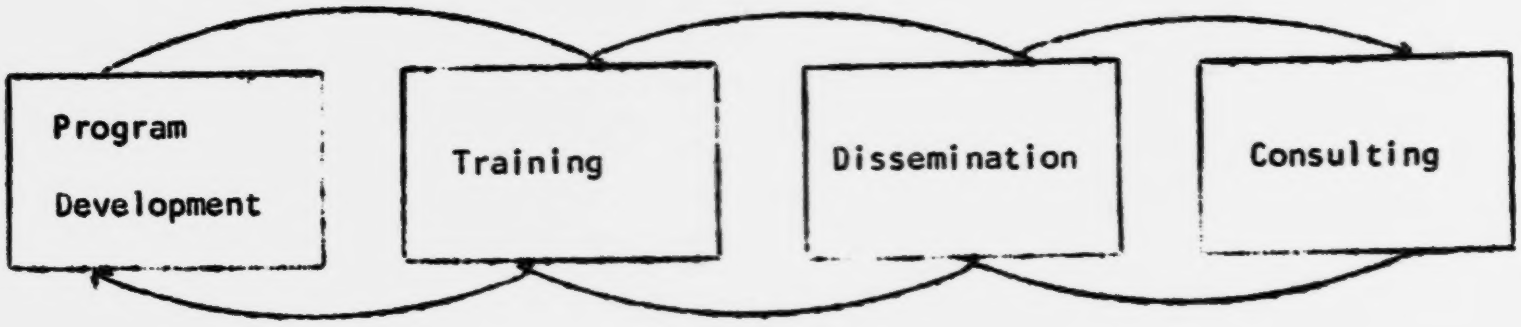


Figure 4

The philosophical beliefs of the coordinator made it impossible to isolate at least three activities of the program and have them function as separate entities. It was impossible to have program development without trial via training programs, and likewise it was not feasible to have program development and training without disseminating these two activities to the educational community. Consulting was possible as an isolated activity because in many instances these services consisted of singular presentations which were terminal and not long lasting.

V. EVALUATION

Formative Evaluation Introduction

Evaluation procedures were an integral part of the activities of the science program. This was particularly so in the area of training. Stufflebeam's definition of evaluation states that evaluation is the science of providing information for decision-making [13]. The retrieval of evaluative data from training participants was important to the attainment of the prime objective of the science program. Participant and staff feedback data enabled the coordinator of this program to make modifications in the Designs series which made the strategies contained within these documents more viable [7, 8, 12]. Thus, the formative evaluation activities greatly influenced the operation of this program.

Data Retrieval System

Formative evaluative data were retrieved utilizing a variety of different methods and types of instruments. Appendix C provides the reader with samples of the various types of instruments utilized to evaluate the science program. The type of instrument selected for use was dependent upon the kind of evaluation data desired.

As was mentioned previously, data were retrieved for each training program conducted. These data were retrieved in a number of ways. During all training programs, various types of Daily Feedback Forms were utilized (see Appendix C_1). These instruments, based on the participants' perceptions, allowed the trainer(s) to assess the daily activities of the program. After analyses of these data were completed, appropriate modifications in the training sessions were made whenever the data analyses indicated that such adjustments would improve the program.

A version of the Semantic Differential based on the work of Osgood at the University of Illinois was employed to assess attitude shifts among participants involved in science training programs with respect to certain concepts [13]. Some of the concepts tested with this instrument included: science, inquiry approach, and evaluation. Use of this instrument enabled the trainers and the coordinator to determine any significant attitude shifts as a result of participation in the science training programs. This instrument was utilized as a pre- and post-test. It was administered during the first training session and upon completion of the last training session. Samples of the specific instruments are shown in Appendix C_2.

Program Evaluation Forms (Appendix C_3) were also used in connection with some training programs. One such instrument was devised by Worthen and Hock at the Ohio State University Evaluation Center, Columbus, Ohio. This type of instrument proved to be of value in assessing the participants' conceptualization of various topics introduced during an evaluation training program conducted in March, 1969 [9]. In addition, this type of instrument enabled the staff to assess the participants' perceptions regarding the adequacy of the amount of time spent in the various training activities. These data were also of value in planning future training offerings in this content area (Evaluation). This type of form was not used as a summative evaluation device for all programs. Rather it is exemplary of a form which was used in a specific program. Using the instrument as a model, it would be possible to design other similar instruments for other kinds of training programs in the future.

Another instrument utilized for some of the training programs was a Group Opinion Survey (see Appendix C_4). This instrument primarily was utilized to assess the effectiveness of presentations to small groups. Trainers were able to modify their subsequent behaviors in small group presentations after analyses of data yielded by this instrument showed that such modifications were necessary.

Finally, other formative data which aided the coordinator in decision-making was gleaned from a variety of other sources. Some of these included such devices as *program application forms*, *registration forms*, *personal interviews with participants*, *informal discussions with participants*, *and a summative interview tape* made during the conclusion of the summer activities, 1968 [7]. These kinds of formative evaluation techniques all provided additional input leading to program modification and improvement. Samples of some of these instruments are found in Appendix C_5.

Summative Evaluation

Introduction

In considering the summative evaluation of the science program, attention was focused primarily on the overall effectiveness of the training activities offered during the program's operation. This evaluation related only to those periods of time during and after the completion of training. No attempt was made to assess the institutionalization of ideas conveyed through training efforts of the program. It might have been well to incorporate this into the evaluation design.

Evaluation of the training efforts focused on the synthesizing of data from the various training programs conducted during the last year. Thus, an attempt has been made to ascertain collectively whether or not significant attitude shifts occurred among the participants in their perceptions of "science" and the "inquiry approach". In addition an attempt has been made to assess the participant's perceptions regarding the strategies and activities carried out during the various training programs.

Data Retrieval Operations

It seems to be beneficial at this point in describing the data retrieval operations to present a model. This model for data gathering was utilized in all training activities with only slight modifications dependent upon the training program or the participants in specific training programs.

The Model Data Gathering System presented is patterned after the four week summer training program that was conducted in June, 1968 [7].

Registration and Application Forms

Participants entering a training program were required to fill out a registration form. In some training programs, they were also required to fill out an application form. Samples of both forms are shown in Appendix C_5. This was done prior to the beginning of the training program. The data reported on these two forms are not used in reporting the summative evaluation of the science program, except to glean the total number of participants trained during the operation of the program.

The Semantic Differential (I)

After filling out the registration forms, the participants were pre-tested using a form of the Semantic Differential. This instrument is based on the work of Osgood in the area of psycho-linguistics [14]. The main purpose of this instrument is to assess any attitude shifts which occurred among the participants as a result of their involvement in a training program conducted under the auspices of the Center's science program; specifically, attitude shifts of the participants in relation to their feelings about science and the inquiry approach.

The Semantic Differential (see Appendix C_2) used contained a total of 19 pairs of polar adjectives with six screening items. The screening items were selected from among those items which did not load heavily on the evaluative factor in Osgood's Measurement of Meaning, while the remaining 13 items loaded heavily on that factor. The six screening items, which were not scored but were included only to obscure the intent of the instrument, were as follows: fast-slow, small-large, weak-strong, sharp-dull, cold-hot, and short-long. A subject's score was calculated on the basis of his response to the thirteen "evaluative" items.

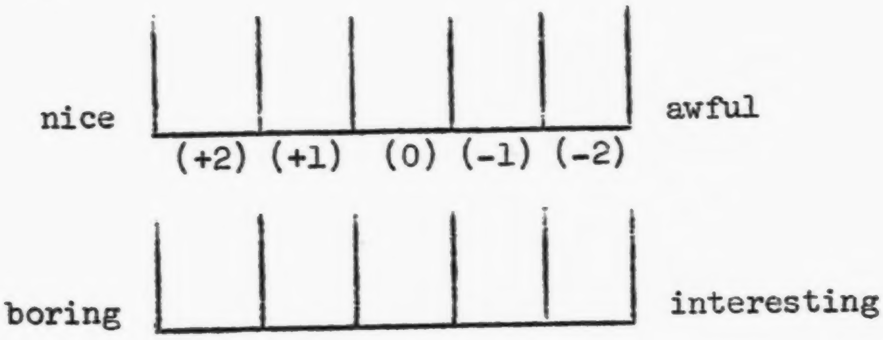
The concepts of "Science" and "Inquiry Approach" were presented to the participants on separate identical instruments. There was a five-point scale to be checked for each pair of polar adjectives in the test.

Method of Analysis

Each of the participants present on the first day and the last day of the training programs was asked to fill out scales for both of the concepts, "Science" and "Inquiry Approach".

In scoring this instrument a numeric value of +2 to -2 was given to each response to the thirteen scored pairs of polar adjectives for both pre- and post-tests. (It will be recalled that six scales were inserted only for screening.)

Example:



The grand mean of both concepts' pre- and post-tests were then calculated for the participants who had completed all the instruments.

The statistical treatment used for the data was a correlated-t test [15]. The paired pre- and post-test scores for each concept were tabulated, and the differences were calculated and squared. The formula applied for the determination of t was:

$$\underline{t} = \frac{\bar{x}_{pre} \qquad \bar{x}_{post}}{\sqrt{\frac{D^2 - \frac{(D)^2}{n}}{n(n-1)}}}$$

TABLE I

Scores on Semantic Differential for the Concept "Science"

Identification Number	Pre- x_1	Post- x_2	D x_1-x_2	D^2 $(x_1-x_2)^2$
1	7	25	-18	324
2	14	10	4	16
3	17	17	0	0
4	16	16	0	0
5	24	21	3	9
6	26	26	0	0
7	21	23	- 2	4
8	15	17	- 2	4
9	2	7	- 5	25
10	2	11	- 9	81
11	17	19	- 2	4
12	16	6	10	100
13	20	26	- 6	36
14	13	26	- 7	49
15	16	20	- 4	16
16	15	20	- 5	25
17	6	16	-10	100
18	26	26	0	0
19	22	19	3	9
20	14	22	- 7	49
21	10	23	-13	169

"Science" scores - continued

Identification Number	Pre- x_1	Post- x_2	D x_1-x_2	D^2 $(x_1-x_2)^2$
22	13	20	- 7	49
23	18	22	- 4	16
24	17	20	- 3	9
25	16	23	- 7	49
26	19	19	0	0
27	18	22	- 4	16
28	18	18	0	0
29	16	16	0	0
30	16	22	- 6	36
31	15	17	- 2	4
32	14	13	1	1
33	13	24	-11	121
34	12	15	- 3	9
35	11	18	- 7	49
36	10	16	- 6	36
37	9	7	2	4
38	1	15	-14	196
Total n=38	555	703	-141	1615

"Science" scores - continued

$$\bar{x} \text{ pre} = \frac{555}{38} = 14.61 \qquad \bar{x} \text{ post} = \frac{703}{38} = 18.50$$

$$S^2_{\bar{D}} = \frac{\Sigma D^2 - \frac{(\Sigma D)^2}{n}}{n\ (n-1)} = \frac{1615 - \frac{(-141)^2}{38}}{38\ (37)} = \frac{1091.82}{1406} = .776$$

$$S_{\bar{D}} = \sqrt{.776} = .88$$

$$t = \frac{\bar{x} \text{ pre} - \bar{x} \text{ post}}{S_{\bar{D}}} = \frac{14.61 - 18.50}{.88} = \frac{3.89}{.88} = 4.42$$

df = 37 .01 = 2.50

TABLE II

Scores on Semantic Differential for the Concept "Inquiry Approach"

Identification Number	Pre- x_1	Post- x_2	D x_1-x_2	D^2 $(x_1-x_2)^2$
1	3	23	-20	400
2	4	12	- 8	64
3	18	18	0	0
4	14	15	- 1	1
5	15	20	- 5	25
6	26	24	2	2
7	14	24	-10	100
8	14	21	- 7	49
9	4	6	- 2	4
10	13	14	- 1	1
11	17	15	2	4
12	8	4	4	16
13	18	24	- 6	36
14	10	26	-16	256
15	14	21	- 7	49
16	19	20	- 1	1
17	7	23	-16	256
18	26	26	0	0
19	15	17	- 2	4
20	14	15	- 1	1

"Inquiry Approach" scores - continued

Identification Number	Pre- x_1	Post- x_2	D x_1-x_2	D^2 $(x_1-x_2)^2$
21	13	23	-10	100
22	11	20	- 9	81
23	23	17	6	36
24	4	16	-12	144
25	16	25	- 9	81
26	19	15	4	16
27	18	22	- 4	16
28	16	25	- 9	81
29	16	17	- 1	1
30	15	13	2	4
31	14	16	- 2	4
32	13	15	- 2	4
33	10	8	2	4
34	10	20	-10	100
35	10	21	-11	121
36	8	25	-17	289
37	5	8	- 3	9
38	2	14	-12	144
Total n=38	496	688	-192	2504

"Inquiry Approach" scores - continued

$\overline{x}$ pre = $\frac{496}{38}$ = 13.05 $\overline{x}$ post = $\frac{688}{38}$ = 18.11

$$S^2_{\overline{D}} = \frac{\Sigma D^2 - \frac{(\Sigma D)^2}{n}}{n\,(n-1)} = \frac{2504 - \frac{(-192)^2}{38}}{38\,(37)} = \frac{1533.89}{1406} = 1.09$$

$$S_{\overline{D}} = \sqrt{1.09} = 1.04$$

$$t = \frac{\overline{x}\text{ pre} - \overline{x}\text{ post}}{S_{\overline{D}}} = \frac{13.05 - 18.11}{1.04} = \frac{5.06}{1.04} = 4.86$$

df = 37 .01 = 2.72

TABLE III

Concept	Mean Pre-test	Mean Post-test	Diff.	Std. Error	t	Degrees of Freedom
Science	14.61	18.50	3.89	.88	4.42*	37
Inquiry Approach	13.05	18.11	5.06	1.04	4.86**	37

* > .01
** > .01

Discussion of Results

Table III shows that the attitudes of the total training group shifted significantly on both concepts (Science and Inquiry Approach) as measured by the Semantic Differential. By definition, a significant change is a change of this magnitude with these groupings which would have occurred only rarely by chance.

These data imply that the group's attitude shifted in a direction which was more positive during the training programs. Therefore, since one of the objectives of this program was to have the participants acquire a more positive attitude toward the inquiry approach and the presentation of science to children, it can be stated that this goal was accomplished.

Conclusion

It can be concluded from these data that the experiences provided by participation in the training programs were responsible for the above mentioned shift in attitude.

Training Feedback Forms (II)

Training feedback forms were distributed to the participants after the conclusion of each daily training session. Various types of forms were utilized. There was no set form which was used due to the fact that as the training programs were developed, attempts were made to improve the daily feedback instruments. Samples of the various forms utilized are found in Appendix C_1.

The use of these instruments, while serving a primary function in formative evaluation, allowed the user to make some summative analysis. This was accomplished by pooling the information on all feedback forms returned during the course of the science program's operation.

Method of Analysis

In analyzing the training feedback forms collected during the various training activities, no statistical treatment of the data was applied. The technique utilized was one of item inspection. That is to say, all data accumulated were examined and the comments were placed into categories (+ or -) based on the judgment of the analyzer (science coordinator). No attempt was made to include in this discussion all of the participants' responses to all of the items or all of the instruments used in all of the training programs. Rather, these data presented and analyzed seem to represent a consensus of participant responses from all of the training programs.

Discussion of Results

Prior to discussing the results of the participants' responses to the training feedback forms, it should be noted that for discussion purposes the training activities of the science program have been placed into three categories. These categories are: (a) general sessions, (b) group activity sessions, and (c) independent study. In this discussion, each category of an activity is considered independently of the others.

General Sessions

The training participants' responses were most positive to: (1) general sessions which were conducted by outside resource consultants, (2) staff presentations which utilized multi-media approaches, and (3) staff presentations which were practical in nature. Some examples of high positive responses from participants included sessions dealing with modern trends in elementary science, elementary classroom facilitations for science teaching, clinical supervision as a technique for improving teaching, and evaluation using the CIPP Model* for evaluation.

The participants' responses tended to be less positive and in some cases somewhat negative when presentations were dominated by the presentor (trainer or consultant). They rejected sessions in which their roles were passive and there were limited opportunities for group interaction via discussion. Responses to sessions in which a good deal of theory was presented were also somewhat negative. The participants seemed to desire practical approaches to the training program's content. Finally, there appeared to be less acceptance of ideas which were presented that tended not to fit their models. For example, such notions as the changing role of the teacher and how to analyze teaching seemed to represent discrepant events which they did not seem eager to deal with in the training program's general sessions.

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*CIPP Model refers to Content, Input, Process, and Product Evaluation. Designed by Stufflebeam at the Ohio State University Evaluation Center, OSU, Columbus, Ohio.

Group Activity Sessions

Group activities in all training programs were positively received by the participants. From the participants' point of view, the maximizing of their involvement was extremely beneficial to their ability to conceptualize the content of the training programs. Upon examining the feedback for all sessions, there is an indication that the degree of active involvement of the participants seems to represent at least one of their criteria for assessing the value of a particular training session or sequence of training sessions.

Independent Study Sessions

The time made available for independent study was received positively by the majority of participants in the various training programs. They indicated that this time was of value because it allowed for interaction among participants regarding the transactions of the program. In addition, this also enabled them to examine materials from various programs. The participants also felt that this block of time was useful for inclusion in the training activities since it allowed them to continue working on activities and experiments which had been started during other types of activity sessions.

Conclusions

The significance of utilizing training session feedback should not be underestimated as a data collecting procedure and a basis for decision making. Individuals functioning at all educational levels over a period of time may become complacent with regard to the assessment of their activities. A possible result of this complacency might be the development of an "I'm right--they're wrong" attitude. This kind of attitude leads to serious problems in any field of endeavor. In education it is fatal.

Educators at all levels must accept and objectively assess all feedback. Based on the examination of this feedback, it is possible to make more rational decisions. Without the utilization of this kind of feedback, it is likely that decision making related to shifts in strategy during a training program and after completion of a program preparatory to the beginning of another will be intuitive and unconscious. Decisions made at these levels are less than desirable and may be ineffective.

Based on the data accumulated from training feedback forms, it was concluded that the participants reacted most positively to:

1. general session activities (lecture) in which the content was of practical value.
2. general sessions presented by outside resource consultants and staff trainers utilizing a multimedia approach.
3. group activity sessions in which their involvement was maximized and they were able to manipulate materials and interact on what they were doing.
4. independent study as a means of continuing the dialogue on training program transactions and continuing activities which they were unable to complete due to the time pressure created in any training program.

Based on the data accumulated from training program feedback forms, it was concluded that the participants reacted most negatively to:

1. general sessions which were highly theoretical in nature.
2. any activities in which their roles were those of passive listeners and there was little or no opportunity for interaction among the participants and the presentors (trainers or consultants).

Participant Interviews As An Evaluation Technique

Introduction

The interview technique described and the data presented were not utilized as an evaluation technique in all training activities of the science program. However, it is felt that this technique holds promise for future use. Therefore, it is presented as a model for the potential consumer of this document.

The interviews were conducted upon the conclusion of a four week summer training program during 1968. The results have also been reported in a report entitled Designs for In-Service Science Training--Summer Science 1968.

Participant Interviews

(A Model--Evaluation Technique)

A data collecting method used to obtain feedback on the training program (Summer Science--1968) was a participant interview technique. The interviews were recorded on audio-tape and conducted by an outside interviewer who was not connected directly with the training program. The interviewer was Dr. Lou Walters, University of British Columbia, Vancouver, B.C.

Fourteen of the fifteen participants were interviewed. One participant was absent on the day the tape was made. Each participant was asked to respond to the five questions shown on the following page.

1. What do you perceive as your role in science education upon return to your local school system?
2. What problems do you think you will encounter upon return to your local school system?
3. a. How do you feel about the new science programs in general?

   b. What program would you adopt if you were in a position to do so? Why?
4. In what ways could the staff have been more helpful to you?
5. What kinds of support can we provide as follow-up to the summer sessions?

Interpretation of Taped Data

By listening to the tape a number of times, it was possible to establish similarities in the responses of the participants. After establishing the similarities, it was possible to arrive at some generalized conclusions with respect to how the participants felt about the training program.

(1) Roles

The majority of the participants felt that they would return to their local school systems and continue in the same role that they had prior to the training program--that of classroom teacher. However, these respondents did feel that they would go back with more knowledge and thus, in this way, would be able to act as resource persons to assist and provide guidance to other teachers who are teaching in their schools.

There were three varying responses by other participants. One individual had already been designated by the school system to act as a science coordinator with a major responsibility of working with classroom teachers. Another participant was to assume the role as a team leader and advisor in the piloting of an innovative program within her school system, and finally, the third felt that he would assume an active role in working with his system's science curriculum committee.

(2) Problems

All of the participants felt that one of the major problems of implementing an innovative program was the availability of sufficient funds for such a purpose.

In addition, the majority of the participants felt that the time to teach these programs was also a factor. They felt that many teachers would be reluctant to try these new programs. Some of the participants felt that they themselves had not reached the point of being comfortable with the new programs even after having just participated in the training program itself. Others expressed concern with knowing how to handle children and their responses in this new kind of a situation. Another deviation from the majority was made by an individual who was new to her school system and at this point in time was unaware of the particular strengths and weaknesses of the teachers with whom she would be working.

(3) Feelings About New Programs and Program Selection

The majority of the participants expressed a positive reaction to the innovative science programs. Of the fourteen participants interviewed, only two expressed uncertainty with respect to the approaches of the new program.

Most participants reacted very positively toward the units developed by the Elementary Science Study. There was also favorable reaction to

Science: A Modern Approach (Holt, Rinehart, and Winston), AAAS *Science: A Process Approach*, *SCIS* (D.C. Heath), and *IPS* (Prentice-Hall).

(4) The Staff

Response to this question showed the greatest variation among participants. The most typical responses included the following:

1. more help with analysis of teaching activities.
2. more structure to the program.
3. more individual help.
4. more outside speakers.
5. more time to examine the available materials.

(5) Support

All of the participants expressed the desire for continuation of the training program into the school year. Some of the participants expressed a desire for help in establishing training programs for their school systems. An additional comment was made by many participants which indicated that they felt the training activities were worthy of recommendation to other colleagues who might be interested in participating in this kind of a training program in the future.

The interpretation of this tape was done by an evaluator from Northern Illinois University. It should be noted that the feeling of this evaluator with respect to the interviewer was that "in many instances he seemed to put too many answers into the mouths of those being interviewed". (Perhaps this was the only way to get some to answer.) It was also an interpretation of the evaluator that "the questioner seemed to be trying to build up the workshop and its usefulness". This was not the feeling shared by the program coordinator as he reviewed the tape.

However, the following was noted with respect to the interviews. The interviewer's bias with respect to particular innovative programs and methods of conducting training programs was reflected in the interviews with participants. It was also noted that some of the participants seemed somewhat skeptical of this means of data gathering and what its uses might be in the future.

Training Program Participants

During the operation of the science program, a total of 92 individuals participated in the training offerings of this program. The chart on the following page indicates the number of individuals, school district affiliation, and educational responsibility of the individuals involved in the various training programs.

TABLE IV: Public School Training Participants

No.	Dist.	County	Primary	Inter.	Jr. High	High School	Supervisory
37	25	Cook	14	20			3
16	132	Cook	9	6	1		
5	4	Cook	2	3			
8	59	Cook	4	3			1
2	167	Cook			1		1
1	147	Cook			1		
1	57	Cook		1			
3	161	Cook	1	1	1		
1	78	DuPage					1
2	300	Kane		1			1
1	106	Lake		1			
4	108	Lake	1	2			1
2	113	Winnebago			1		1
83			31	38	5	0	9

TABLE V: Parochial School Training Participants

No.	Name	Location	Prim.	Inter.	Jr. High	High S.	Supervisory
4	Bd. of Educ. Archdiocese	Chicago					4
3	Immanuel Lutheran	Elmhurst			2		1
1	St. Raymond	Mt. Prospect					1
1	St. Vincent	Chicago			1		
9			0	0	3	0	6

TABLE VI: Summary Chart Of All Training Participants

Total No. Trainees	School Systems Represented	Responsibility Levels				
		Prim.	Inter.	Jr. High	High School	Supervisory
92	14	31	38	8	0	15

Discussion of Tables

Tables IV and V represent a specific breakdown of the training participants by educational responsibility (i.e., primary, intermediate, junior high, etc.). The primary section represents teaching responsibility K-2. Intermediate represents teaching responsibility 3-6; junior high, 7-8; and high school, 9-12. The supervisory column includes science coordinators, consultants, curriculum directors, building principals, and other administrative personnel.

The tables are self explanatory with regard to the data presented. However, it should be noted that not revealed in these tables is the fact that eleven individuals who are represented in these tables had participated in three different training programs conducted during the operation of the Center's science program. Thus, if we counted these eleven as separate, new individuals, the number of training program participants could be considered to be 103 instead of 92.

Conclusion

Considering the relatively short period of time that the science program was in operation, it is the opinion of the science coordinator that the number of individuals trained is (judged to be) significant.

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APPENDIX A

CHRONOLOGICAL OVERVIEW

APPENDIX A

Chronological Overview

January 15, 1968	Science Coordinator appointed to T & D Staff
January 20-February 29, 1968	Development of Training Proposal #2 for Submission to Department of Program Development for Gifted Children (Illinois-Office of Superintendent of Public Instruction)
February 1-April 4, 1968	"Process" Science Workshop - 10 Sessions - 1 per week
March, 1968	Training Proposal #1 accepted for funding
April 1, 1968	"Organization and Operation of Three Kinds of In-Service Training Programs" presented at National Conference of the National Science Teachers' Association, Washington, D.C.
May 17, 1968	Conference on the Implementation of Modern Science Programs
June 24-July 22, 1968	Training Program in Science Teaching and Curriculum Development for Gifted Children (Training Proposal #1)
August 19-24, 1968	Initial training - - Arlington Project
September-October, 1968	Development of Training Proposal #2 for Submission to Department of Program Development for Gifted Children (Illinois-Office of Superintendent of Public Instruction)
September 30, 1968 October 7, 21, 28, 1968	Minimal Training Program - Calumet Park, Illinois
October 4, 1968	"Innovative Science Training Programs" presented at Regional National Science Teachers' Association, Chicago, Illinois
September, 1968 - January, 1969	Continuation Training - Arlington Project
January 27-28, February 10-11 March 3-6, 1969	Continuation Training Program in Science Teaching and Curriculum Development for Gifted Children - - Emphasis on Analysis of Teaching, Supervision, and Evaluation (Training Program #2)

Chronological Overview (Continued)

February, 1969	Development of a Proposal to Train Resource Consultants for the State in Science for Submission to Department of Program Development for Gifted Children (Illinois-Office of Superintendent of Public Instruction)
February 21, 1969	"Individualizing Science Instruction" presented at East Suburban Education Association Institute Day, Rockford, Illinois
March 22, 1969	"A Design for Stimulating an Internal Change Process to Improve Science Education for Children" presented at National Conference of the National Science Teachers' Association, Dallas, Texas
March 27, 1969	"Modern Junior High School Science Teaching" presented at Danville, Illinois - Teacher Institute Day
June 30-August 7, 1969	State Institute to Train Resource Consultants in Science

APPENDIX B

INNOVATIVE SCIENCE TRAINING PROGRAM

OUTLINES AND SYLLABI

Elk Grove Training and Development Center

SCIENCE ACTIVITIES

William F. Labahn, Coordinator

The availability of an increasing number of innovative science programs has resulted in the creation of a gap between the producers of the innovative programs and the consumers. The gap which exists is in the area of in-service training for teachers who will use these programs in the presentation of science to children. The science activities of the Center currently concern themselves with efforts to narrow this existing gap between producers of the innovative programs and the potential or actual consumers of the programs. Our method lies in the designing of strategies for in-service science training programs.

In education, we readily recognize the individual differences which exist among children. This recognition has led to the confrontation of dealing with these individual differences. Yet, we seem to be willing to assume that the needs of the school systems, the schools, and the teachers within these systems are all the same and can be treated as such in any in-service programming which is planned.

A basic assumption of the "Designs" series which is currently being developed is contrary to this assumption. The series seeks to provide schools with alternative models as they prepare to consider in-service science training for their teachers. As models, the local school system can use the materials contained in each program within the series to meet their individual needs. Those investigating the alternative models may accept or reject any or all parts of the model. The models exist for the consideration of the consumer. It is significant to note that the series of alternative models under development have been used and have been proven to be operationally effective.

The models currently developed and being prepared for dissemination include a four-week summer program, a school system-approach program for the stimulation of interest in change and innovation, and a short-term program for schools that have chosen to implement an innovative science program. Through the continuation of our work with individual schools and school systems, other alternative models for in-service training will emerge. This is assured as long as we continue to base our activities on the individual needs of the consumers of our services.

In addition to the development of training designs, the science activities of the Center also include the conducting of periodic science conferences and the providing of consultant services upon request.

In conclusion, we at the Center have been fortunate in establishing close working relationships with colleges, universities, and the publishers of educational materials. Without the supportive and cooperative efforts of these institutions and the school systems we serve, our efforts would be futile and our accomplishments would be nil. Due to the fact that we have been able to establish supportive and cooperative relationships, it is our feeling that the science activities and the activities of the total Center will continue to make a significant contribution to the continued improvement of educational practices and procedures for our children.

"PROCESS" SCIENCE WORKSHOP - ELEMENTARY IN-SERVICE PROGRAM

February 1 - April 4, 1968

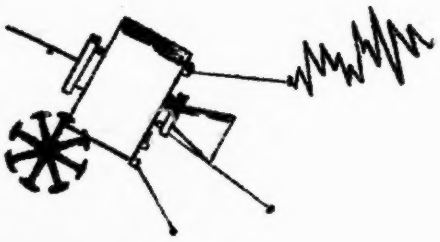
In this workshop the elementary science teacher will have an opportunity to examine the contemporary philosophy behind and the methods for implementing effective science instruction. The instructional program will have as its central goal the active involvement of all participants in a variety of experiences in science. Opportunities to explore and critically evaluate selected contemporary science investigations will be made available through observation of demonstration lessons and through direct experience with children.

The following schedule is subject to change if the need for modification becomes apparent.

Date	Time	Topic for Investigation
Feb. 1	2:00 - 4:00	General Orientation and Philosophy Objectives in Science
Feb. 2	9:00 - 11:30	Inquiry with Levers Demonstration with Children - Compound Bar and Density
	12:30 - 2:30	Evaluation in Science Demonstration with Children - Levers
Feb. 9	9:30 - 10:00	Developing Observational Skills
	10:00 - 11:30	Candle Observation and Inquiry
	12:30 - 2:00	Multi-sensory Observation and Relative Motion
Feb. 16	9:30 - 10:00	Developing Measurement Skills
	10:00 - 11:30	Linear Measurement
	12:30 - 2:00	Using Numbers - Rate of Change
Feb. 23	9:30 - 10:00	Conceptual Schemes NSTA and Others
	10:00 - 11:30	Classification Systems
	12:30 - 2:00	Variables in Classification
Mar. 1	9:30 - 10:00	Learning in Science
	10:00 - 11:30	Inferring - The Electrical Circuit
	12:30 - 2:00	Energy and Matter

Date	Time	Topic for Investigation
Mar. 8	9:30 - 11:00	Solutions and Crystallization
	11:00 - 11:30	Constructing a Key
	12:30 - 2:00	An Analysis of Mixtures
Mar. 15	9:30 - 10:30	Activities
	10:30 - 11:30	Activities
	12:30 - 2:00	Activities
Mar. 22	9:30 - 2:00	Activities
Apr. 4	9:30 - 10:30	Report on NSTA National Convention
	10:30 - 11:30	Open for Activities as Needed
	12:30 - 1:30	Open for Activities as Needed
	1:30 - 2:00	Evaluation of Training Program

CONFERENCE ON THE IMPLEMENTATION OF MODERN SCIENCE PROGRAMS



SPONSORED BY

THE ELK GROVE TRAINING AND DEVELOPMENT CENTER

(Title III E.S.E.A.)

SPEAKERS

Dr. Abraham Fischler, Professor of Science Education and Dean of the Educational Center, Nova University, Fort Lauderdale, Florida

Sister Mary Ambrosia, Science Coordinator, Archdiocese of Detroit, Detroit, Michigan

Dr. David Schulert, Director of Curriculum, Lansing Public Schools, Lansing, Michigan

Mrs. Judith Lowe, Elementary Science Teacher, Juliette Low School, Community Consolidated School District 59, Arlington Heights, Illinois

Conference Objectives

1. to provide participants with information regarding the kinds of activities which are essential to the planning and successful implementation of a modern science program
2. to provide participants with information regarding the changing roles of various kinds of professional educators which evolve as a result of modern science program implementation

Conference Time Schedule

8:45 – 9:15	Registration
9:15 – 9:30	Welcome
9:30 – 10:30	Address by Dr. Fischler
10:30 – 10:45	Coffee Break
10:45 – 11:30	Question and answer session with Dr. Fischler
11:30 – 12:30	Luncheon (Concord Motor Inn Dining Room)
12:30 – 1:30	Address by Sister Ambrosia
1:30 – 2:30	Address by Dr. Schulert
2:30 – 2:45	Coffee Break
2:45 – 3:30	Address by Mrs. Lowe
3:30 – 4:30	Informal question and answer session involving all speakers

DATE MAY 17, 1968

TIME 9:15 – 4:30

LOCATION O'Hare Concord Motor Inn
6565 N. Mannheim Road
Rosemont, Illinois
(2 miles north of O'Hare International Airport)

A TRAINING PROGRAM IN SCIENCE TEACHING
and
CURRICULUM DEVELOPMENT FOR GIFTED CHILDREN

at

ELK GROVE VILLAGE, ILLINOIS

Sponsored by

Office of the Superintendent of Public Instruction
Department of Program Development for Gifted Children

and

The Elk Grove Training and Development Center

Objectives

1. To provide the participant with opportunities which will allow him or her to adapt and develop science teaching strategies, which are useable in the presenting of science to gifted children
2. To provide the participant with competencies in the utilization of devices which have as their purpose the assessment of behaviors in teaching and supervision
3. To provide the participant with competencies in the above mentioned areas so that he or she might return to his or her local school system and establish training programs which will affect change in his or her colleagues, the ultimate result being the improvement of science programs for gifted children and others within the local educational community

Program

Participants in the training program will carefully examine and work with materials currently useable as teaching strategies for children in science (i.e., IPS, Time-Space-Matter, ESS, and others). Since none are specifically designed for gifted children, participants will be provided with opportunities to adapt existing materials to meet the needs of this segment of their school population. They will also have opportunities to work on strategies of their own devising which can be used with gifted children.

Participants will observe staff members and at times themselves be involved in the teaching of "micro-classes" of 4-5 children, utilizing materials already showing promise as strategies for gifted children. Emphasis in this phase of the training program will be on the examination of behaviors - both the teachers' and the children's - for the purpose of diagnosing learning problems and problems intrinsic to the materials and the teaching strategies. Self assessment protocols and other devices for analyzing teaching and supervision will also be utilized.

The aforementioned will be accomplished with four day per week sessions extending over a period of time from June 24 - July 22, 1968. The daily time schedule for activities will be from 8:00 A.M. - 4:00 P.M.

GENERALIZED DAILY SCHEDULE OF ACTIVITIES

Summer Science 1968

Time	Activity	Staff
* 8:00 - 9:00	General Session	Good/Labahn
9:00 - 10:00	Small Group Sessions	Staff
10:00 - 10:30	Coffee Break	
10:30 - 12:00	Elementary Science Class	Stitt
10:30 - 12:00	Jr. High Science Class	Tofano
12:00 - 1:15	Lunch and Critique of Science Classes	Staff
*1:15 - 3:30	Participant Small Group or Independent Activity	Staff
3:30 - 4:00	Staff Meeting	

*Consultants were sometimes utilized in these time slots and in some instances, they occupied the total A.M. or P.M. segment of the day.

Overview of Analysis and Supervision Training Session

Dates - January 27, 28 and February 10, 11, 1969

Staff - Dale Good, Henry Slotnik, Jack Preston; University of Illinois

Introduction

The first two days emphasis will be placed on the following areas in Analysis and Supervision of Science Teaching:

1) nature of data
2) data gathering
3) uses of data
4) particular techniques for gathering data.

The third day will focus on Supervisory Behavior and the role of the science supervisor in small group processes.

Objectives of Analysis and Supervision Training Sessions

Day 1 - Jan. 27, 1969

1. The participants will realize the type of data obtained depends on the techniques used.
2. The participants will employ the VICS technique for describing simulated classroom situations.
3. The participants will select areas of the VICS matrix that reflect desirable, undesirable and highly interdependent teaching styles.

Day 2 - Jan. 28, 1969

1. The participants will understand that the type of data gathered in the classroom is a function of:
    a. who wants the data and,
    b. what's going to be done with the data.
2. The participants will demonstrate they understand that the reporting

is influenced by:

a. the consumer

b. use of data

by compiling a structured summary of the workshop to this point.

Day 3 - February 10, 1969

1. The participants will identify problem areas for science curriculum personnel in a school system.
2. The participants will establish guidelines for describing the desirable profile of group interaction.
3. The participants will employ a specific technique for evaluating simulated science department meetings.

Day 4 - February 11, 1969

"Presentation on Clinical Supervision Techniques"

Presented by Dr. Abraham Fischler, Dean of Graduate Studies
Nova University
Fort Lauderdale, Florida

GENERALIZED TRAINING SCHEDULE

Evaluation Session

Day 1	March 3, 1969	
9:00 - 9:15	Welcome and Introductions	
9:15 -10:30	Keynote Address	Dr. Herbert Smith, Associate Dean Colorado State University Fort Collins, Colorado
10:30 -11:00	Coffee	
11:00 -12:00	Evaluation Sensitization Problem	Ohio State University Evaluation Team*
12:00 - 1:00	Lunch	
1:00 - 3:00	CIPP Evaluation Model	
3:00 - 4:00	Developing Evaluation Designs	

Day 2	March 4, 1969
9:00 -12:00	Simulated Evaluation Design Problem -- School System Level
12:00 - 1:00	Lunch
1:00 - 4:00	Continuation of A.M. Activities

Day 3	March 5, 1969
9:00 -10:30	Completion of Simulated Evaluation Design Problem
10:30 -11:00	Break
11:00 -12:00	Types of Instrumentation for Data Collection
12:00 - 1:00	Lunch
1:00 - 4:00	Instrument Packet Familiarization and Simulated Situations

Day 4	March 6, 1969
9:00 -12:00	Simulated Evaluation Problem -- Classroom Level
12:00 - 1:00	Lunch
1:00 - 3:00	Continuation of Simulated Evaluation Problem
3:00 - 4:00	Conference Evaluation and Feedback Session

* This team is composed of Dr. B. R. Worthen, M. D. Hock and M. K. Kean, all from the Ohio State University Evaluation Center. All subsequent activities (days 1-4) will be conducted by this team.

Syllabus For A Summer Institute
Designed To Train Resource Consultants (Science)
For The Department of Program Development for Gifted Children - OSPI

June 30 - August 7, 1969 William F. Labahn, Director

Institute Staff

William F. Labahn, Institute Director
Elk Grove Training and Development Center
1706 West Algonquin Road
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Dr. Abraham Fischler
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Dr. William Hedges
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Dr. Blaine Worthen
Associate Director
Ohio State Evaluation Center
Ohio State University
Columbus, Ohio

Dr. James Weigand
Chairman, Science Education Department
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Science Education Consultant
P.O. Box 262
Aspen, Colorado

Dr. Herbert Smith
Associate Dean
Colorado State University
Fort Collins, Colorado

Mrs. Gloria Kinney
Director
Elk Grove Training and Development Center
Arlington Heights, Illinois

Introduction

The following syllabus has been prepared for you as a comprehensive guide to the activities of this summer institute. It is divided into sections which provide you with detailed information about each aspect of the program. In addition, you will find pre-institute requirements for which you have responsibility. These are things you must do prior to the beginning of the institute -- June 30. We have also indicated our expectations regarding the requirements of the institute for you as individual participants. The last section of the syllabus provides you with a comprehensive list of all the materials that will be available for your use during the institute program.

We would like to call your attention to the fact that while we have spelled out in rather specific detail the various events of the institute, degrees of flexibility have been built into the planning process. The staff has the prerogative of switching various activities and making adjustments in the schedule of events. In addition, we will be sensitive to your needs and whether or not your expectations are being fulfilled. Therefore, we will always attempt to operate in an open manner as we proceed through the summer's activities. The staff will be very receptive to your thoughts and ideas on how the institute might be improved.

William F. Labahn and John Tofano

Major Aims of the Institute

This institute is designed to provide you with the basic tools necessary for the conducting of in-service training programs which ultimately will lead to the improvement of science education for children. The tools needed for an individual to become a trainer of teachers seem to fit into four major categories. The trainer needs to:

(1) be provided with a practical experience which will allow him to develop an in-service training program.

(2) be familiar with and exhibit a degree of competency with behavioral assessment instruments and methodology to be employed in their use.

(3) be familiar with and have knowledge of the available new learning systems in science education for children. He needs to have alternative strategies available which can be recommended which will assure some degree of effectiveness in the implementation of these learning systems within local school systems.

(4) be able to provide alternatives for the evaluation of a) classroom programs, b) system wide programs, c) learning systems, and d) student achievement.

The acquisition of knowledge in these areas should enable each of you to become a meaningful resource to the local school systems which you will be serving as these systems attempt to up-grade their science programs.

Pre-Institute Requirements for Participants

Prior to the beginning of the institute we are asking that you each prepare an audio-tape of at least 30 minutes duration in which your students are involved in a class discussion dealing with one of the following topics:

Population Explosion

Space Exploration

Exploration of the Ocean

Conservation of Natural Resources

Air and Water Pollution

We have purposely made these topics very borad in nature so that each of you as individuals can develop the particular content within the broad category of your choice. This will also allow you to conduct the discussion on a level appropriate for your particular class. These tapes should be submitted to the director by June 16.

In addition, we would like to have each of you submit sample copies of two unit tests which have been given to your students during the course of this academic year. We will be using these in connection with the activities related to the improvement of test construction for students during the institute. These tests should be submitted to the director by June 16. Send these materials to the address below -

William F. Labahn
Elk Grove Training and Development Center
1706 West Algonquin Road
Arlington Heights, Illinois 60005

Institute Requirements

TASK I

During the institute each individual or small groups of individuals will be required to design a model in-service program. This activity will be carried out during the duration of the institute. The staff will develop a simulated description of a school system and their needs with regard to the establishment of an in-service training program in science. Your task will be to "fill in the blanks" with respect to how the in-service program can be developed and implemented within the perimeters which have been established in the simulation. Each small group or individual will have to submit a copy of their model in-service training program prior to the termination of the institute. These will be duplicated and each individual will be able to carry away a set of these materials with them. The specific guidelines and strategies for accomplishing this task will be considered during the first two days of the workshop during the block of time which we are calling Structured Activity Sessions.

Also included in the requirements of this institute are a number of required readings. Specifically you will be required to read Chapters in the following:

TASK 2

1. Hurd and Gallagher's book - New Directions in Elementary Science (Chapters 1, 2, 3, 5)
2. Kuslan and Stone - Teaching Children Science: An Inquiry Approach (Chapters 2, 4, 5, 11, 13)
3. Gallagher - Research - A Summary of Gifted Child Education (Chapters 1-5)
4. Amidon and Hunter - Improving Teaching (Chapters 1,2,10)
5. Hedges - Evaluation in the Elementary School (Chapters 1-10)

You will also receive a collection of selected readings in science education and other related areas for your use during this institute program. All reading materials will be made available through the institute.

TASK 3

During the institute each of you will be required to conduct an in-service training lesson during the Structured Activity Sessions. You will be responsible for choosing the topic for presentation, planning the session, gathering materials needed, and the actual conducting of the session. A follow-up critique of your training lesson will be held during the afternoon seminar session on the day of your presentation. If you desire the video taping of your presentation for your own self-assessment you should make arrangements with the staff in advance of the presentation.

Transactions of the Institute

The following pages contain a breakdown of specific activities which will be occurring during each of the four training phases of the institute. The four phases are as follows:

1. General Sessions
2. Structured Activity Sessions
3. Independent Study
4. Seminar Sessions

Generalized Daily Time Schedule

9:00 - 10:15	General Session
10:15 - 12:00	Structured Activity Session
12:00 - 12:45	Lunch
12:45 - 2:15	Independent Study
2:15 - 3:30	Seminar Session
3:30 - 4:00	Feedback and Clean-up Session

(The Coffee Pot will be available throughout the day.)

GENERAL SESSIONS

Date	Topic	Presentor
June 30	Introduction to Summer Institute	Labahn
July 1	A Status Report on New Science Programs	Labahn-Tofano
July 2	The Curriculum and Planning for Curriculum Change	Labahn
July 3	Physical Facilities for Modern Science Teaching	Tofano
July 7-8-9	Test Construction for Evaluation of Student Achievement in Science	Hedges

Date	**Topic**	**Presentor**
July 10	Budgeting for Modern Science Programming	Labahn-Tofano
July 14	Proposal Writing	Labahn
July 15-16	Performance Goals in Science Teaching	Weigand
July 17 & 21	Individualizing Science Instruction	Labahn
July 22-23-24	The Gifted Child and Self-Assessment Techniques	Labahn-Tofano
July 28-29-30	Evaluation for Decision Making in Program Modification	Worthen
July 31	Change Agentry	Kinney
August 4	Techniques for Behavioral Assessment	Fischler
August 5	Individualized v.s. Traditional Instruction	Fischler
August 6	To be announced	Fischler
August 7	Open	

STRUCTURED ACTIVITY SESSIONS

Date	**Topic**	**Staff Member in Charge**
June 30-July 1	Planning Session on In-Service Model Development	Tofano-Labahn
July 2	In-Service - A Model Approach?	Labahn
July 3	In-Service - A "Real" Model Approach	Labahn
July 7	Test Item Analysis - A Critique	Hedges
July 8	Test Construction	Hedges
July 9	To be announced	Hedges
July 10	Participant Training Presentation	Staff
July 14	Participant Training Presentation	Staff
July 15	Writing Performance Goals	Weigand

Date	Topic	Staff Member in Charge
July 16	Improving Performance Goal Writing Ability	Weigand
July 17	Participant Training Presentation	Staff
July 21	To be announced	Lewis
July 22-23-24	Participant Training Presentation	Staff
July 28-29-30	To be announced	Worthen
July 31	Participant Training Presentation	Staff
August 4	Demonstration Lesson with Children	Fischler
August 5	Writing a Student Unit Module	Fischler
August 6	To be announced	Fischler
August 7	Institute Program Evaluation	Staff

INDEPENDENT STUDY SESSIONS

During the Independent Study Sessions it is felt that you should have an opportunity to exercise your right to choose from a variety of options available with respect to how this particular time block is utilized within the framework of this institute. The staff has prepared the following list of alternatives from which you may choose.

1. Group work on in-service training program design
2. Required reading assignments
3. Pre-viewing and reviewing media materials (films, film loops, film strips and transparencies)
4. Examination and exploration of lessons from various new science programs
5. Meeting with staff members and/or participants on topics of interest
6. Extend morning activities
7. Participation in interest groups which will form to study field ecology

8. Others (Your choice)

9. Play

NOTE: Each of you will be asked to submit a calendar of how you will use this independent study time during each week of the institute program. This is not binding. You change your plans and select from other alternatives if you wish. The calendar provides the staff with a general idea of how you will use your time. Its prime function for the staff lies in its use as a potential guidance tool.

SEMINAR SESSIONS

Date	Topic	Staff Responsibility
June 30-July 1	Planning Session - In-Service Model Development (small group)	Staff
July 2	Critique of Structured Activity Session	Staff
July 3	Critique of Structured Activity Session	Staff
July 7-8-9	To be announced	Hedges
July 10	Participant Training Presentation Critique	Staff
July 14	Participant Training Presentation Critique	Staff
July 15	Question Asking Behavior of Teachers	Weigand
July 16	A Second Critique on Performance Goals	Weigand
July 17	Participant Training Presentation Critique	Staff
July 21	To be announced	Lewis
July 22-23-24	Participant Training Presentation Critique	Staff
July 28-29-30	To be announced	Worthen
July 31	Participant Training Presentation Critique	Staff
August 4	Critique of A.M. Lesson	Fischler-Labahn

Date	Topic	Staff Responsibility
August 5	Hartford "74"	Fischler
August 6	Science for the 70's	Fischler
August 7	No Seminar	

APPENDIX C

EVALUATION INSTRUMENTS

Date ________,1969

APPENDIX C_1

Code Number _______

SCIENCE TRAINING FEEDBACK FORM

1. Please express your general impressions of today's session, using the following scale: 1 = Very Good - through - 5 = Very Poor. (Circle the number you feel best describes your choice).

   Training Session: 1 2 3 4 5

2. What things did we do that were most helpful for you as an individual?

3. What things should we do to make future sessions more meaningful?

4. Do you have any questions you would like answered during the next session? If so, what are they?

5. Make any other comments you wish regarding this session.

WFL/tt
2769

PARTICIPANT DAILY REACTION SHEET

Session Date________________________

A. Your questions (about content, facilities, etc.)

B. Your comments (on content, presentation, instruction, facilities, etc.)

C. Your suggestions (regarding content, instruction, arrangements, etc.)

APPENDIX C$_2$

INQUIRY APPROACH

fast						slow
sad						happy
nice						awful
small						large
unpleasant						pleasant
clear						hazy
weak						strong
interesting						boring
unfair						fair
clean						dirty
sharp						dull
important						unimportant
sour						sweet
cold						hot
good						bad
worthless						valuable
meaningful						meaningless
long						short
distasteful						tasty

Code Number________

Pre-test - Post-test

(Circle appropriate
test)

EVALUATION

fast						slow
sad						happy
nice						awful
small						large
unpleasant						pleasant
clear						hazy
weak						strong
interesting						boring
unfair						fair
clean						dirty
sharp						dull
important						unimportant
sour						sweet
cold						hot
good						bad
worthless						valuable
meaningful						meaningless
long						short
distasteful						tasty

SCIENCE

fast	______	______	______	______	______	slow
sad	______	______	______	______	______	happy
nice	______	______	______	______	______	awful
small	______	______	______	______	______	large
unpleasant	______	______	______	______	______	pleasant
clear	______	______	______	______	______	hazy
weak	______	______	______	______	______	strong
interesting	______	______	______	______	______	boring
unfair	______	______	______	______	______	fair
clean	______	______	______	______	______	dirty
sharp	______	______	______	______	______	dull
important	______	______	______	______	______	unimportant
sour	______	______	______	______	______	sweet
cold	______	______	______	______	______	hot
good	______	______	______	______	______	bad
worthless	______	______	______	______	______	valuable
meaningful	______	______	______	______	______	meaningless
long	______	______	______	______	______	short
distasteful	______	______	______	______	______	tasty

APPENDIX C_3

Code Number________

CONTINUATION TRAINING PROGRAM IN SCIENCE: EVALUATION SESSIONS

ELK GROVE TRAINING AND DEVELOPMENT CENTER

MARCH 3-6, 1969

PROGRAM EVALUATION

Check the appropriate boxes:

Teacher	☐	Elementary	☐
Supervisor	☐	Junior High	☐
		Senior High	☐
		College	☐

Below are a number of statements concerning concepts that were included in the content of this workshop. You are to indicate how much you agree or disagree with each of the statements by encircling the letter representing one of the following expressions.

Strongly Disagree (SD); Disagree (D); Neither Agree nor Disagree (N);

Agree (A); Strongly Agree (SA)

1. I now have a better idea of what evaluation is "all about" than I had before this workshop.	SD	D	N	A	SA
2. Evaluation plays a critical role in educational improvement.	SD	D	N	A	SA
3. The evaluation concepts and techniques presented in this institute have little relevance to evaluation problems I am likely to face in the future.	SD	D	N	A	SA
4. Looking at types of decisions (planning, programing, implementing, and consequential) is a useful way to begin to focus on the type of evaluation information which is needed.	SD	D	N	A	SA
5. I feel that I could identify types of decisions which need to be made in most science programs with which I might work.	SD	D	N	A	SA
6. The CIPP (context, input, process, and product) evaluation model is a useful way to view evaluation of science programs.	SD	D	N	A	SA

7. It is important to do context and input evaluation before deciding on a program or plan of action. SD D N A SA

8. In general, I feel that I would know how to conduct context evaluation in planning a science program. SD D N A SA

9. In general, I feel that I would know how to conduct input evaluation in selecting from among alternative programs, etc. SD D N A SA

10. In general, I feel that I would know how to conduct process evaluation in monitoring program activities. SD D N A SA

11. In general, I feel that I would know how to conduct product evaluation in relating outcomes to objectives. SD D N A SA

12. The structure for developing evaluation designs is useful in attempting to design an evaluation for a science program. SD D N A SA

13. I feel I could use the structure for developing evaluation designs to design an evaluation which met minimal evaluative criteria. SD D N A SA

14. Many of the techniques identified on the third day of the workshop (e.g., interviews, unobtrusive measures, achievement tests, etc.) are relevant for evaluation in science programs. SD D N A SA

15. I believe that I personally could use most of the techniques if they seemed relevant. SD D N A SA

16. I believe I understand when the varying techniques might be appropriate. SD D N A SA

17. The first simulated evaluation design problem (school system level) was useful in giving me a feel for how one might go about designing an evaluation. SD D N A SA

18. The second simulated evaluation design problem (math text selection) was useful in helping me begin to understand how one might go about designing an evaluation. SD D N A SA

19. The feedback in the simulations was helpful to me in understanding the design process. SD D N A SA

20. The packet of sample instruments helped me to recognize examples of different types of instruments for data collection. SD D N A SA

21. The use of simulated "instrument selection situations" (on third day of the workshop) was useful to me in learning to select the most appropriate type of instrument for specific types of situations. SD D N A SA

22. I feel a positive reaction toward the ideas presented at the workshop. SD D N A SA

23. The objectives of this workshop were not the same as my objectives. SD D N A SA

24. I could have learned as much by reading a book. SD D N A SA

25. The instructors really knew their subject. SD D N A SA

26. The daily schedules were too fixed. SD D N A SA

27. There was too much lecture and too little interaction. SD D N A SA

28. Simulation is a useful technique for learning about general stages and processes in evaluation. SD D N A SA

The major topics which were presented in this workshop are listed below. Would you please respond to each topic by checking whether you think the time spent on it was too much, too little, or about right.

During the workshop, the time spent on this topic was:

(check one)

FIRST DAY	Too Much /	About Right /	Too Little
1. Keynote Address (Smith)	☐	☐	☐
2. Evaluation sensitization problem (Hock)	☐	☐	☐
3. CIPP evaluation for decision-making (Worthen-Hock)	☐	☐	☐
4. Developing evaluation designs (Worthen-Hock)	☐	☐	☐

SECOND DAY	Too Much	About Right	Too Little
1. Simulated Evaluation Design Problem--School System Level (Hock-Worthen)	☐	☐	☐

THIRD DAY	Too Much	About Right	Too Little
1. Techniques for gathering evaluation information (Worthen)	☐	☐	☐
2. Instrument Packet Familiarization and Simulated Selection Situations (Worthen-Hock)	☐	☐	☐

FOURTH DAY	Too Much	About Right	Too Little
1. Simulated Evaluation Design Problem--Math Textbook Selection (Worthen-Hock)	☐	☐	☐
2. Evaluation of workshop (what you're now doing) (Labahn)	☐	☐	☐
Total time spent in the workshop was:	☐	☐	☐

Elk Grove Training and Development Center
Science Training Program Survey
(Arlington Heights School District #25)

RETURN TO CENTER BY MARCH 12

School______________________________ **Grade Level**________________

QUESTIONS	YES	NO	COMMENTS
1. Are you aware that one of your colleagues in your building has been participating in a science training program offered by the T & D Center?			
2. Have you had an opportunity to discuss with this individual a) his activities in this training program?			
b) the new science program he is using with his students this year?			
3. Have you had an opportunity to observe this individual teaching his science program to students?			
4. Have you heard this individual make a presentation on modern science at a faculty meeting in your building this year?			
5. Have you participated in a grade-level and/or team meeting on science conducted by this individual?			
6. Have you participated in a building-level science training program conducted by this individual and/or the science consultant?			
7. As a result of your involvement with this individual during the year have you modified the science program you are presenting to your students?			
8. Would you be interested in participating in a science training program offered by your school system or an outside agency such as the T & D Center during the next school year?			

Science Training Program

Questionnaire

Your viewpoint regarding the questions below will help us greatly in planning future training opportunities. Circle the responses which best describes your viewpoint on each question.

SA (Strongly Agree) A (Agree) N (Neutral) D (Disagree) SD (Strongly Disagree)

1. We should plan future training sessions on a half-day basis.

SA____ A____ N____ D____ SD____

Comment____

2. We should place greater emphasis on how the activities are applicable to real classroom situations.

SA____ A____ N____ D____ SD____

Comment____

3. We should spend part of the training sessions in small group activity for the purpose of preparing lessons to try with children.

SA____ A____ N____ D____ SD____

Comment____

4. We need a better science background to make activities more meaningful.

SA____ A____ N____ D____ SD____

Comment____

5. We need a better background of what modern science is all about.

SA____ A____ N____ D____ SD____

Comment____

Questionnaire (Cont.)

6. We need a separate training programs for primary teachers (K-2).

SA_____ A_____ N_____ D_____ SD_____

Comment____

____

7. We need a separate training program for middle-grade teachers (3-6).

SA_____ A_____ N_____ D_____ SD_____

Comment____

____

8. We should have more teaching demonstrations with small groups of children.

SA_____ A_____ N_____ D_____ SD_____

Comment____

____

9. We should demonstrate modern science with an entire class of children.

SA_____ A_____ N_____ D_____ SD_____

Comment____

____

10. I would like to have a chance to work with a small group of children during the training sessions.

SA_____ A_____ N_____ D_____ SD_____

Comment____

____

11. I would be willing to have my activities with a small group of children video-taped for the purpose of analyzing my style of teaching.

SA_____ A_____ N_____ D_____ SD_____

Comment____

____

12. I now feel I could go back to the classroom and implement a science program utilizing an inquiry approach.

SA____ A____ N____ D____ SD____

Comment____

____

APPENDIX C_4

GROUP MEETINGS: OPINION SURVEY

This is a survey of your opinions concerning ten elements of this meeting. Each element is presented as two alternative statements.

Circle the letter which indicates which statement you agree with and to what extent you agree with it.

	A	Strongly Agree With A	Slightly Agree With a	No Choice X	Slightly Agree With b	Strongly Agree With B	B
1.	GOALS were fuzzy, contradictory, or just plain missing. We weren't sure of where we were going.	A	a	X	b	B	GOALS were clear to all. We had a definite sense of direction.
2.	PARTICIPATION was lacking. We served our own needs. We watched from outside the group. We were "grinding our own axes."	A	a	X	b	B	PARTICIPATION was present. We were sensitive to the needs of our group. Everyone was "on the inside" participating.
3.	AUTHENTICITY was present. We were revealing our honest selves. We were engaged in authentic self revelation.	A	a	X	b	B	AUTHENTICITY was missing. We were wearing masks. We were being phony and acting parts. We were hiding our real selves.
4.	LEADERSHIP was dominated by one or more persons.	A	a	X	b	B	LEADERSHIP was shared among the members according to their abilities and insights.
5.	COMMUNICATION OF IDEAS was poor; we did not listen. We did not understand. Ideas were ignored.	A	a	X	b	B	COMMUNICATION OF IDEAS was good. We listened and understood one another's ideas.. Ideas were vigorously presented and acknowledged.

A	Strongly Agree With A	Slightly Agree With a	No Choice X	Slightly Agree With b	Strongly Agree With B	B
6. ACCEPTANCE OF PERSONS was an active part of our give-and-take. We "received one another", recognizing and respecting the uniqueness of each person.	A	a	X	b	B	ACCEPTANCE OF PERSONS was missing. Persons were rejected, ignored or criticized.
7. PRODUCTIVITY was high. We were digging hard and were earnestly at work on a specific task. We created and achieved something.	A	a	X	b	B	PRODUCTIVITY was low. We were proud, fat and happy just coasting along. Our meeting was irrelevant; there was no apparent agreement.
8. CLIMATE OF RELATIONSHIP was one of hostility or suspicion or politeness or anxiety or superficiality.	A	a	X	b	B	CLIMATE OF RELATIONSHIP was one of mutual trust in which evidence of respect for one another was apparent. The atmosphere was friendly and relaxed.
9. FREEDOM OF PERSONS was enhanced and encouraged. The creativity and individuality of persons was accepted.	A	a	X	b	B	FREEDOM OF PERSONS was stifled. Conformity was explicitly or implicitly fostered. Persons were not free to express their individuality. They were manipulated.
10. TIME was used wisely. We used the time to do all that we wanted to do or were scheduled to do.	A	a	X	b	B	TIME was wasted. We used the time to do unimportant things.

Your comments about this "Opinion Survey"______________________________

APPENDIX C_5

REGISTRATION FORM

the Elk Grove Training and Development Center

1706 West Algonquin Rd., Arlington Heights, Ill. 60005 (312) 259-8050

Communication was focused on:

English	1
Madison Math	2
Developmental Math	3
In-Service	4
Indiv.Instr./Learn.Centers	5
Social Studies	6
Science	7
Self-Imposed Schedule	8
Orff Music	9
Motor Facilitation	10
Closed Circuit TV	11
Fine Arts	12
Evaluation	13
Leadership Training	14
T & D Center	15

PLEASE PRINT

Purpose of contact made:

☐ Visit ☐ Workshop ☐ Conference

Date______________________________

Name____
(Last) *(First)* *(Middle Initial)*

Title and/or Position____
(Be specific

Address________________ ________________________________
(Number) *(Street, route, box no.)*

____
(Name of School District or employers) *(District No.)*

____
(School or building)

____
(City) *(State)* *(Zip Code No.)*

Sex: M____ F____ Highest degree held:______________________________
(Specify)

Subject Speciality:____________________________________
(Be specific)

__________Years experience in education profession.

Circle the grades you have taught: K 1 2 3 4 5 6 7 8 9 10 11 12

____Junior College ____College ____Other_____________________________
(Specify)

The school you work in is: __elementary __junior high __high school __other____________
(specify)

Number of students in your school ____________, in the District_______________

Number of teachers in your school_____________, in the District_______________

How did you learn of this (these) Model Program(s)?

____Brochure ____Supt. ____Principal ____Curriculum Director ____Teacher

____Speaker ____Other____
(specify)

Will you respond to a follow-up in the near future? ____Yes ____No

RL:jh
10/68

LEADERSHIP IN NEW EDUCATIONAL DIRECTIONS, A TITLE III PROGRAM OF E.S.E.A.

SUMMER INSTITUTE
IN SCIENCE EDUCATION LEADERSHIP

June 30, 1969 - August 7, 1969

Grove Jr. High School
777 Elk Grove Blvd.
Elk Grove Village, Illinois

* * * * * * * * *

APPLICATION FORM

Name ____

Home Address ______________________________________

____

Telephone Number ____________________

School Address ____________________________________

____

Telephone Number ____________________

Male ____ Female ____ Age ______

Highest Degree Held ________________________ Years Taught ______

Present Position __________________________________

Position Next Year ________________________________

Subject Area and/or Grade Level Taught ____________

____

____

Science Background (Specify hours as semester or quarter)

Astronomy ____________________ Earth Science ____________________

Biology ____________________ Science Methods ________________

Chemistry ____________________ Others ___________________________

Physics ____________________

Current text or science program being used ____________________________

____

Have you had previous experience with any of the experimental elementary and/or junior high school or high school science curriculum programs?

____

Explain on reverse side.

Use other side of application form for any additional information which you feel is significant for us to consider in reviewing your application.

Return to:

William F. Labahn, Associate Director
Elk Grove Training and Development Center
1706 West Algonquin Road
Arlington Heights, Illinois 60005

APPENDIX D

DIRECTORY OF CONSULTANTS UTILIZED IN INNOVATIVE SCIENCE TRAINING PROGRAMS

APPENDIX D

Directory of Consultants

Utilized In Innovative Science Training Programs

Lolita Buikema
Elk Grove Training & Development Center
Arlington Heights, Illinois

Dr. Harold Collins
College of Education
Northern Illinois University
DeKalb, Illinois

Frank Dzikonski
Science Consultant
District 25
Arlington Heights, Illinois

Dr. Robert Estin
Department of Physics
Roosevelt University
Chicago, Illinois

Dr. Abraham Fischler
Dean of Graduate Studies
Nova University
Fort Lauderdale, Florida

Dale Good
College of Education
University of Illinois
Urbana, Illinois

Dr. Orrin Gould
Associate Professor of Science Ed.
University of Illinois
Urbana, Illinois

Ronald Hager
Elk Grove Training & Development Center
Arlington Heights, Illinois

Dr. Donald Hamilton
Western Illinois University
Macomb, Illinois

Dr. William Hedges
Chairman
Elementary and Secondary Education
University of Missouri
Columbia, Missouri

Michael Hock
Ohio State Univ. Evaluation Center
Ohio State University
Columbus, Ohio

Raymond Janota
Chairman
Science Department
Rich Township High School
Park Forest, Illinois

Michael Kean
Ohio State University Eval. Center
Ohio State University
Columbus, Ohio

Dr. Maurice Kellogg
Western Illinois University
Macomb, Illinois

Gloria Kinney
Director
Elk Grove Training & Development Center
Arlington Heights, Illinois

Robert Lewis
Science Education Consultant
P. O. Box 262
Aspen, Colorado

John Preston
College of Education
University of Illinois
Urbana, Illinois

Robert Purvis
University of Texas
Austin, Texas

Henry Slotnik
College of Education
University of Illinois
Urbana, Illinois

Dr. Herbert Smith
Associate Dean
Colorado State University
Fort Collins, Colorado

Mary Stitt
Principal
District 25
Arlington Heights, Illinois

John Tofano
Principal
Community Consolidated School Dist. 59
Elk Grove Village, Illinois

Dr. Lou Walters
Associate Professor of Science Ed.
University of British Columbia
Vancouver, British Columbia

Dr. James Weigand
Chairman of Science Education
Indiana University
Bloomington, Indiana

Dr. Blaine Worthen
Associate Director
Ohio State Univ. Eval. Center
Ohio State University
Columbus, Ohio

APPENDIX E

OUTSIDE EVALUATION TEAM REPORT - 1969

THE INNOVATIVE SCIENCE TRAINING PROGRAM

The Innovative Science Training Program is designed to focus on training programs and services that bridge the "Old Science -- New Science" gap in grades K through 8. The program has been operational approximately one year. Its main objectives are twofold:

1. To train school personnel in the use of innovative science programs, and
2. To design model in-service training programs which are developed through the actual involvement of trainers, trainees, and support staff or administrators.

The activities through which the objectives of the program are to be implemented include the following:

1. A "Process Science Workshop", ten sessions in length, held in the winter of 1968 attended by 21 participants from five school districts.
2. A "Conference of Modern Science" attended by approximately 160 participants, including teachers, science coordinators, school administrators as well as representatives from colleges, universities, and industry. The program consisted mainly of presentations by a science educator, a science supervisor, and a teacher. The conference attendants came from a three state area.
3. A "Summer Training Program" that was four weeks in length and attended by 15 participants representing and financed by eleven school districts. The focus of this program was on new developments in elementary science programs and analyses of teaching approaches.

4. The "Arlington Project" in which seventeen teachers were involved in five all-day sessions in the summer (1968) and four half-day sessions during the regular school year. Approximately twenty additional participants were involved in one or more of these half-day sessions; included in this latter group were members of the T & D English staff, administrators from other consortia, a high school principal, and a consultant from Office of the Superintendent of Public Instruction of Illinois. The focus of the Arlington Project was: (1) initial training in alternative programs in modern science; (2) an introduction to methods and procedures for analyzing teaching; and (3) the distribution of teaching units for use in the classes of the participants. The activities of the attending teachers were followed-up through actual classroom visitations.
5. A "Five-Session Training Program" for eighteen teachers of a school system planned to train participants in the use of a particular innovative science program. The sessions met one day each week from 3:30 to 5:00 p.m. with supplemental grade level meetings and demonstration classes.
6. A "Continuation Training for Summer Participants" planned with two and three day sessions for January (27-28), February (10-11), and March (3-6). The schematic orientation of the sessions are: an "Analysis and Supervision" and "Evaluation" in science teaching. Presentations will be made mainly by non-staff consultants.
7. An Institute for Leadership Development in Science Education: planned by the staff of the T & D Center and funded by the Department for the Gifted of the Office of the Superintendent of

Public Instruction of Illinois. This institute is tentatively planned for fifteen participants selected from throughout the State. The institute will be six weeks in length with content in these areas: the analyses of teaching; the evaluation of instruction; the evaluation of science programs in school systems; strategies for working with teachers; the systematic assessment of established science programs; and lesson development for gifted children.

The staff has utilized various procedures and instrumentation to assess the impact of this program. Included among these are interviews, interview tapes, questionnaires, and attitude scales (pre and post) administered to program participants. In addition, follow-up classroom visitations and interviews with students, teachers, supervisors, and administrators are or will soon be implemented.

Assessment

1. The training objective of the program is extensive as judged by the total number of people involved in training sessions.
2. The variety of training programs outlined and utilized reflects an attitude of desiring to offer specific training programs aimed at specific target groups with specific needs. High priority is placed upon utilizing evaluation feed-back information for purposes of improving the effectiveness of future meetings with a group or future training activities with similar groups. The activities seem to be purposeful, well developed and organized, and responses of trainees seem to be positive.
3. There is evidence of continued interest in involvement, in that more than two-thirds of the participants in the "Summer Training

Program" will be participating in the "Continuation Training for Summer Participants." Otherwise, it is difficult to assess the impact of the training program in the terms of: (1) Knowledgability about program, (2) trial, or (3) adoption in individual schools in view of the absence of formal follow-up as to the degree of implementation.

4. The publication entitled Designs, Designs for In-service Science Training, 102 pages, is an excellent description of a model training program. This document is as complete as it is attractive. Obviously it meets the criteria of an effective model in that the elements essential for a model or guide are present. Those interested in designing a training program for elementary science program are provided a functional model with these elements: rationale and objectives for training; recruitment procedures and selection criteria; transaction descriptions with illustrative lessons; methodologies; content identification; evaluation procedures with instrumentation and illustrations of use; and a complete appendix that provides added detail. This plus other printed materials though less detailed than the above document, are deemed to be of comparable quality.

The Innovative Science Training Program is judged by the Evaluation Team to have been highly successful in accomplishing the major objectives of (1) training and (2) the design of a model in-service training program. Certainly it is hoped that this program can be continued through other source of funds such as school consortium, the state education agency, private foundations, etc.

In fact, the style and quality of the major document prepared in this program might well serve as a model for the summative reports for other projects of the T & D Center. Such publications could provide documentation that would be effective in reaching target populations including teachers, teacher training institutions, supervisors, administrators, professional associations, state education agencies, publishers, and others involved in demonstration and dissemination. Hopefully, this might preserve the significant contributions of the T & D Center during its abbreviated existence.